COMMERCIAL FISHERIES Review

VOL. 30, NO. 12 DECEMBER 1968

COVER: Fish net on BCF's research vessel 'Albatross IV' is set out during snowstorm on fishing banks south of Nova Scotia. (Robert K. Brigham)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

FISHERMEN'S MEMORIAL--GLOUCESTER, MASS.

Managing Editor: Edward Edelsberg

Associate Editor: Barbara Lundy

Production Manager
and Associate Editor: Jean Zalevsky

Production: Alma Greene (Senior Compositor)
and Mary Andrews

The Bureau of Commercial Fisheries and
The Bureau of Sport Fisheries and Wildlife
make up The Fish and Wildlife Service of
The United States Department of the Interior.

Throughout this book, the initials BCF stand
for the Bureau of Commercial Fisheries.

Address correspondence and requests to: Commercial Fisheries Review, 1801 North Moore Street, Room 200, Arlington, Va. 22209. Telephone: Area Code 703 - 557-4246.

Use of funds for printing this publication was approved by the Director, Bureau of the Budget, April 18, 1968.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.
Price 60 cents (single copy). Subscription Price: $7.00 a year; $2 additional for foreign mailing.

CONTENTS

FISH-FLOUR COOKIES AT U.N. A U.N. staff member gives Mark Allen of United Kingdom a taste. Arthur Goldschmidt, a U.S. delegate, brought the cookies and protein-enriched soft drinks.

The Economic and Social Council, discussing the world's protein shortage, stressed that protein was needed most by growing children.

A report before the Council warns that lack of protein threatens 300 million children with retarded growth and possible mental damage. ("The New York Times")

U.S. FISHERMEN LANDED ABOUT 4.1 BILLION POUNDS IN 1968

In 1968, the fishermen of the United States landed approximately 4.1 billion pounds with an exvessel value of about $442 million--an increase of about 80 million pounds and $5 million above 1967. These are preliminary figures.

The catch of fish used as food decreased; the catch of fish for industrial products increased.

Exvessel prices for most species increased, but there were notable exceptions as a result of foreign competition.

The total U.S. supply of fish and shellfish set a record because imports increased significantly.

MENHADEN

Landings of menhaden increased more than 180 million pounds. This reversed the downward trend of 1967, when the 1.2-billion-pound catch was the lowest since 1951. However, landings did not reach those of the peak period, 1959-62, when over 2 billion pounds were taken each year. The greatest increase in 1968 took place in the Gulf; it was followed by the Chesapeake and Middle Atlantic States. Menhaden were nearly one-third of total landings of fish and shellfish in 1968.

SHRIMP

The most valuable U.S. fishery--shrimp--grew stronger. Demand was relentless and prices rose through 1968. The catch topped the 1967 record by a small percentage. This resulted primarily from Alaska's expanding fishery and, to a lesser extent, Maine's.

The catch from the Gulf of Mexico, the most important shrimping area, decreased from 1967's high volume. The value of shrimp to fishermen, much higher than that of any other species, was about $100 million--a drop of about 3% from 1967. Production of canned and breaded shrimp increased. The canned pack was the greatest since the 1930s.

ALASKA'S SALMON

The Alaskan salmon fisheries recovered from the disasterously low production in 1967. The canned pack was nearly doubled. The catch rose over 100 million to about 240 million pounds. Most of this resulted from the catch of more pink salmon. Because the salmon catch in Washington and Oregon fell, the overall increase in U.S. salmon landings rose only 80 million pounds in 1968.

TUNA

The tuna fleet, exclusive of the Puerto Rican part, caught 30-35 million fewer pounds in 1968 than in 1967. The exvessel price increased slightly over the 1967 price, so overall value of the landings to fishermen went up.

The catch of albacore and yellowfin was higher, skipjack's was cut in half, and that of

bluefin was at about the 1967 level. Albacore were in good supply in the north Pacific Ocean. Landings in Oregon set a State record.

The U.S. canned pack of tuna (including Puerto Rico's) processed from domestic landings and the catch by foreign nationals was about at the 1967 production level of 20 million standard cases.

PACIFIC HALIBUT

The Pacific halibut fisheries fared poorly. Although frozen inventories in early 1968 were not excessive, competition from imported fish products created problems. Compared with the 1967 period, lower prices for Pacific halibut prevailed throughout virtually the entire fishing season. Exvessel prices were lower in May, when the fishing season in major waters opened, and fewer vessels participated. Although prices increased during latter 1968, the fishing season was just about over.

The U.S. and Canadian catch from the convention area was around 49 million pounds (dressed weight). This was 9.5 million pounds fewer than the quota and the lowest since 1935.

The Canadian catch was 59 percent, the highest proportion taken by the Canadian fleet in this century.

U.S. landings of approximately 20 million pounds (equal to about 27 million pounds live weight) were more than 30 percent less than in 1967. They were the lowest since the recording of annual landings data began in 1915.

NEW ENGLAND LANDINGS

Compared with 1967, 1968 landings at principal New England ports declined less than 1 percent in volume--and rose 9% in value. The high exvessel value of sea scallops accounted for most of the increase in total value.

The catches of important species, except sea herring, that increased were: flounders, whiting (silver hake), and cod. Combined, these increased over 16 million pounds and $1 million. Of the 3, cod alone dropped in exvessel price--down 13%. The other volume species, haddock and ocean perch, fell 28% and 12% in quantity, and 15% and 13% percent in value. The catch of yellowtail, the most important species of flounder, increased 23% and its value 20%. Landings of fish for industrial use in New England were up 10% in volume but down 1% in value. The canned pack of Maine sardines, from domestic and imported sea herring, was the greatest since 1954; it was over 200,000 cases above the 1967 pack of $1\frac{1}{4}$ million standard cases.

ALASKA'S SEA SCALLOPS

The development of Alaska's sea scallop fishery was noteworthy. Throughout most of 1967, BCF, State agencies, and industry conducted experimental fishing. Then, in January 1968, commercial production began. By October, 8 vessels were fishing: 4 converted vessels from the northwest Pacific Coast, and 4 transfers from New Bedford, Mass.

Sea-scallop landings topped 2 million pounds of edible meats with an exvessel value of over $2 million. A record trip was set for all ports when one vessel on an 11-day trip landed 68,000 pounds. Despite a sea-scallop scarcity in Atlantic fishing areas, principally off New England, Middle Atlantic and Chesapeake States, landings exceeded 1967's low production of 10 million pounds of edible meats. High prices were principally responsible for the higher catch: average exvessel price soared over 50% above 1967's. At New Bedford, Mass., the main Atlantic Coast port, converted and new vessels entering the scallop fishery increased the fleet to at least 44 by year's end. This was the largest fleet fishing sea scallops in recent years. Also, some boats at other Atlantic Coast ports, as far south as North Carolina, took part.

ALASKA'S KING CRABS

King crabs were scarce and landings were only about 85 million pounds. This species, fished extensively in recent years, peaked in 1966 at 159 million pounds. The 1967 landings were 128 million pounds. Late in 1968, exvessel prices increased over 250 percent above those of a year earlier. These prices were a strong incentive for increased fishing effort.

DUNGENESS CRABS

Dungeness crab production set a record of nearly 50 million pounds, more than 12 million above 1967 and about 4 million pounds above the 1948 record. Because king crabs were scarce, some vessels shifted to the Dungeness crab fishery. This produced a record Alaskan catch of nearly 16 million pounds, about 3 million above the previous high in 1964.

BLUE CRABS

Blue-crab landings were far fewer and prices substantially higher than in 1967. Blue crabs were scarce in the Atlantic coastal area. Major catch decreases occurred in the normally high-productive Chesapeake Bay area. Because of the high exvessel price, fishing increased in virtually all areas. Although overall catch fell about 30%, its value to fishermen was near the $8 million they had received in 1967.

GREAT LAKES

In 1967, for the first time in the Great Lakes fisheries, coho salmon (1.5 million pounds) taken from Lake Michigan were sold commercially. The 1968 commercial catch was slightly greater.

FOREIGN TRADE

Imports of fishery products--in volume and value--set records in 1968. The declared value was about $795 million. In 1967, the figure was $709 million. In 1966, the previous high year, it was $720 million.

Fish meal, a valuable ingredient in animal feed, comprises the bulk of nonhuman food imported. Its imports increased more than 150,000 tons above 1967's record of 651,000 tons. Greater shipments from Peru and, to a lesser extent, Chile, were responsible.

The quantity of imported fishery products for human food was nearly 1.7 billion pounds--up from 1.5 billion pounds in 1967 and 1.6 billion pounds in 1966. Nearly all commodities gained. Among these were all species of fresh and frozen marine and fresh-water fish, including fillets and blocks, frozen tuna, fresh and frozen northern and spiny lobster, and canned sardines. Canned tuna was up slightly. Shrimp products were imported at about the 1967 high volume, but the percentage of raw peeled and canned meats increased, while raw, shell on, headless decreased. Receipts declined for such canned products as bonito or yellowtail, oyster meats, crabmeat, and lobster meat.

Exports of domestic fishery products for human food were down over 20 million pounds from 108 million pounds exported in 1967 and 110 million pounds in 1966. Salmon, principally canned but also fresh and frozen, fell most. Canned squid shipments were about the same, and canned sardines were up only slightly from 1967.

Exports of menhaden oil through September 1968 dropped to about half the quantity shipped from U.S. ports in January-September 1967. Exports of menhaden oil in 1967 were 76 million pounds.

UNITED STATES

State of U.S. Fisheries Outlined by BCF Director

Speaking at "Fish Expo" in Boston, Mass., on October 16, H. E. Crowther, BCF Director, outlined "The State of Our Fisheries." The text follows:

Some of us in the Bureau of Commercial Fisheries are often asked by the press to comment briefly on the condition of the U.S. fishing industry. I am concerned each time this is asked of me because it is difficult to give a precise answer.

Our so-called domestic fishing industry is not a single entity. It is made up of as many segments as there are fisheries--each an industry within itself. Even the segments have parts or sectors, such as the producers (fishermen and boatowners), the processors, and the distributors. Also, processors and sellers of imported products are part of the U.S. fishing industry. Each segment and part has its own interests and problems and these may differ widely. The present condition of our fisheries or their sectors varies from record prosperity to severe depression.

During the past year many writers have pointed out repeatedly that the United States has fallen from second to sixth place in world fishery production. This fact usually is cited as if it were a disgrace for the United States to be in this position. In my opinion, our rank in world fisheries production is much less important than the economic condition of our fisheries. If it could be said that our domestic fishing industry had found it economically possible to expand its production to supply the U.S. demand for fishery products, I would be satisfied, even if we ranked 25th as a fisheries nation.

Unfortunately, we have not expanded our production. We have less than 7 percent of the world population, but we consume about 11 percent of world fishery production. Our per capita utilization of fish has increased almost 100 percent since 1957. We have the most attractive fishery market in the world, yet we supply less than 30 percent of the U.S. demand from the catch of our vessels. Of even more concern is the apparent trend in production. Our domestic catch has dropped nearly 20 percent by weight since 1960. Yet, under these conditions some of our fisheries have flourished. This is further evidence that our fisheries are separate industries. Let us take a look at the present condition in some of our established fisheries from the point of view of the producer and the processor.

PRODUCER

Here in New England some of our major segments, such as the haddock fishery, find it difficult to operate at a profit. The resource on Georges Bank, on which the industry depends heavily, has suffered from a series of years of poor spawning survival. The last successful spawning (1963) which could have carried the haddock industry through the later years of poor survival was hit hard by the massive Soviet fleet just when the fish were large enough to be caught. In the market place, as well as on the fishing grounds, New England producers are facing severe competition from imported fishery products and from domestic food products.

In the Middle and South Atlantic area in 1967, the menhaden industry experienced one of its poorest years. A severe resource problem caused by poor survival due to unknown environmental causes or overfishing, or both, tied up vessels and closed plants. In addition to having limited quantities of fishmeal to sell, menhaden producers faced a market flooded with imported meal and a severely depressed market for oil.

The Gulf of Mexico brings a completely different story. For the first time in history a U.S. fishery (for shrimp) brought $100 million to fishermen. The year 1967 was the best ever for our shrimp industry. Not only was the resource in good shape, but the market continued to expand in spite of relatively high prices.

For the tuna industry of the Pacific Southwest, 1967 was one of the most successful years on record. Although the yellowfin tuna fishing season was shortened by the regulations imposed by the Inter-American Tropical Tuna Commission, the U.S. industry succeeded in landing over 71,000 tons of yellowfin tuna and 60,000 tons of skipjack. The tuna

industry is an example of a segment of our fishery which overcame its foreign competition through improved efficiency.

In the Pacific Northwest, in 1967, the halibut industry began to feel the effect of incidental catches of halibut by foreign and domestic trawlers. Although the trawlers were seeking other species, the massive volume of their catches, especially by the foreign vessels, meant that millions of young halibut were caught and did not survive. Since halibut do not enter the longline fishery until they are 8 or 9 years old, the effect of the incidental catch was delayed in appearing. Along with reduced catches, prices of halibut were down, so this industry did not have a successful year in 1967. No improvement is evident thus far in 1968.

In Alaska, 1967 produced one of the smallest packs in the history of the Alaska salmon fishery through the unique and unfortunate coincidence of low cyclic abundance of all species--and in virtually all districts. But 1968 was much better because of a near record run of pink salmon which is expected to produce a pack of nearly 2,000,000 cases, compared to a meager yield of 345,000 cases in 1967.

In the Great Lakes area, we saw the inexpensive alewife dominate the fisheries, while in other inland areas, the remarkable catfish farming industry continued its rapid growth.

While our older, established fisheries were experiencing success mixed with failure, some new fisheries appeared, and other comparatively new ones expanded. The new Alaska scallop fishery continues to attract attention because of the high rate of catch and the price of the product. Catches of more than 45,000 pounds of shucked scallops in 10 days--at a landed price of over $1 per pound--would be attractive to nearly anyone. Whether the resource is large enough to sustain this level of fishing is the question scientists are asking.

Another relatively new scallop resource--the calico scallop in the South Atlantic--continues to look promising. It may turn out to be a resource equal to that of shrimp in the Gulf and South Atlantic.

A large hake resource in the Pacific Northwest and an untapped thread herring population in the Gulf of Mexico are waiting to be harvested.

Off the coast of Maine, the new shrimp fishery continues to produce and show promise. The tanner crab fishery in Alaska continues to expand to make up for the reduced abundance of king crab.

These and other new fisheries have contributed to the total U.S. catch. Had it not been for their development, U.S. production would have declined even more. Over the recorded history of U.S. fisheries, the catch has been maintained only by constantly seeking new species or new stocks. Resource after resource has figured prominently in the catch and later dropped to a position of minor importance. Thus, the U.S. fisheries have barely held their own by shifting to new resources as the yield of older fisheries diminished. Yet, while our catches have remained static or declined over the past 10 years, foreign vessels have taken more and more fish off our coasts. In 1967, the foreign catch in waters adjacent to our coasts was estimated to be about 7 billion pounds, which is more than the total U.S. catch.

The established and new fisheries referred to are composed of only a few of the species which make up the total so-called U.S. fishing industry, but they represent a fair cross-section. From these few examples I think it should be clear that it is impossible to generalize regarding the condition of our industry.

On the other hand, although segments of our fisheries vary greatly in many respects, some of the problems they face are identical:

1. Many are feeling the effects of declining resources due, at least in part, to foreign competition.

2. A number are plagued with resource failures due to problems which we as a nation have brought on ourselves. Pollution, destruction of estuaries, and overfishing are taking their toll of some of our fishery resources.

3. Some are finding it increasingly difficult to compete with imported fishery products as well as a variety of attractive protein products from other domestic sources.

How can we solve these major problems?

1. The problem of foreign competition for the resource is difficult. However, in the near future we must find a solution. By some means, some type of international management system must be put into effect, and the special interests which coastal nations have in resources off their coasts must be protected. Many people are at work trying to find a solution to this problem.

2. Resource failures, even within our own waters, will never be eliminated completely as long as we harvest wild species which depend on favorable oceanographic conditions for their survival. But we should be able to prevent resource destruction caused by the unwise acts of man. When our public becomes fully aware of and is sufficiently concerned about the effects of pollution and the destruction of estuarine areas, action will be taken. Whether this will come soon enough to save many species of fish is anyone's guess.

3. Foreign competition in some of our markets can be met by only two methods: (a) some form of assistance to the domestic industry to compensate for subsidies by foreign governments and/or (b) lowering the cost of producing domestic fishery products. Possible means of reducing costs center around mechanization of locating, harvesting, and processing procedures--and elimination of economic barriers, such as illogical regulations, which hamper the production of domestic fishery products.

PROCESSOR

In common with the producer, the processing segment of our industry has no single answer to its problems. However, processors are generally in much better shape than producers. Their position is much more flexible in regard to supply of raw material and in prices paid for fish and received for their finished products. But even within the same fishery, some processors are enjoying profitable operations and find ready markets for their products at acceptable prices, while others find it difficult to move their products at a profit.

Some processors operate modern, efficient, and well-managed plants that are comparable with the best in any other food industry in the United States. They produce products of a quality anyone would be proud of. Other processors of fishery products cannot boast of the same efficiency, and the quality of their products leaves much to be desired. In many cases, quality is sacrificed for profit. This type processor tends to tarnish the image of the entire fishing industry, weakens the demand for fishery products in general, and eventually puts himself out of business.

Has there been any improvement in quality over the past few years? I am sure there has, for more and more companies are producing better products. But there are still inferior products on the market. Unfortunately, even a small percentage of poor quality products hurts the entire industry, for it creates uncertainty in the mind of the consumer. Eliminate this uncertainty, and we will see per-capita consumption rise. Perhaps this can be done through development and promotion of an identification shield used by processors dedicated to quality. However, I am afraid that the only certain method is through mandatory inspection.

Millions of pounds of fish are inspected each year under the Bureau's (BCF) voluntary inspection program, paid for by processors packing inspected products. Fishery products produced by these companies are of high quality when they leave the plants. However, the program has one shortcoming--it cannot be used by the entire industry. For only those plants producing a substantial volume can afford the inspection program. So far, we have tried unsuccessfully to find a formula which would make the voluntary inspection program available to small plants. We are still trying.

If mandatory inspection of fish and fishery products should come to the United States, and most of us believe it will, we can expect hardships for some companies and some vessel owners. But, if the mandatory inspection program is a reasonable one, and the industry can weather the first few years of its operation, there is no doubt that the entire industry will benefit.

At this point, let me mention that some few fishing vessels and some few processing plants are not the only ones responsible for

quality loss. I am disturbed when I see how fresh or frozen seafood is handled in some distribution outlets. When I see fishery products stored at temperatures far too high to maintain proper quality, I think of the quality control that went into it at the plant, only to be neutralized by carelessness at the point of distribution. Any program designed to insure wholesome and high-quality products for the consumer must include all steps in product handling from the point of capture until it is in the hands of the consumer.

NEW PRODUCTS

When we look at the price and the demand for fishery products today, we find an unusual situation. Some luxury products, such as king crab and shrimp, are enjoying unprecedented demand. Even with substantial price increases, demand exceeds supply. But, while some luxury products enjoy this success, our "bread and butter" products such as groundfish are in trouble. There have been many explanations for this. Perhaps it is the quality, the flavor, the effect of promotion, the ease of preparation, or the desire of the consumer for something new in food that has influenced demand. Perhaps all of these have had an effect. Whatever the reason, I think this gives us a clue for future success. In my opinion, one of the greatest potentials in the industry is product development. Not just a slight modification, but a new product developed from our low-priced fish, such as cod and whiting, or from some underutilized species, such as herring and hake. Some will say it is not possible. I do not agree, for all of these species have the basic ingredients needed for an excellent food. The protein of such fish is unequaled and the texture is desirable.

I predict that in time a completely new fishery product will be developed--one that is such a "natural" that it will be accepted immediately. In this era of unbelievable technical developments, who can say that this is impossible? There is no doubt in my mind that it is possible! In my opinion, a highly acceptable product is waiting to be developed, and when it comes along we will say, "Why didn't I think of it?"

Who will develop these products? So far Government has stayed out of this type of research, except by special invitation from a specific segment of an industry facing a particular problem. If the fishing industry can do the job, it should. If industry cannot handle it alone, perhaps it should call the Government for assistance. As far as my position as Director of the Bureau of Commercial Fisheries will permit me to do so, I offer a proposal. We are prepared to join you in seeking new types of fishery products--products which will allow us to upgrade some of our lower-priced species or use some of the unutilized raw materials off our coasts. We will join you in efforts to produce a luxury-type food product that will be in demand. By join, I mean a joint effort between industry and Bureau staff. Together, we have an excellent chance for success.

One final thought. I am annoyed when I hear the "fishing industry" referred to as a sick industry. It is true that some segments are in trouble, in many instances through no fault of their own. But, as I mentioned earlier, some parts of our industry are progressive and profitable. It is possible that our entire industry could be upgraded if we could properly identify the problems it is facing, and then propose effective solutions. To do this, the Bureau is suggesting a Master Plan for Commercial Fisheries, which we hope would become a joint effort of industry (producers and processors), States, Universities, the Federal Government, and any organization interested in fisheries. Soon we will arrange meetings with all groups who have an interest in a particular fishery (such as the New England groundfish) to attempt to reach agreement on program priorities. The plan is too complex to explain in the limited time available, but it will be published soon and described at future meetings. By seeking the advice of those who have worked in or with each segment and part of our industry, we should be able to make real progress in charting our course for the future.

Plan to Overcome World Hunger Outlined by 'American Assembly'

The world's rapidly increasing population will reach 6 to 7 billion by the year 2000. Breakthroughs in food technology--the development of new, high-yield seeds, for example--make it possible to feed such a large population. But serious food shortages in the remaining years of this century can be prevented only if 2 decisive forces are brought to bear simultaneously on the problem: reduced population growth and increased food production in the world's hungry nations.

This was the theme of the 34th American Assembly, which met at Arden House, Harriman, New York, Oct. 31-Nov. 3, 1968.

The American Assembly, an affiliate of Columbia University, was established by Dwight D. Eisenhower in 1950. It conducts nonpartiasn meetings and publishes books illuminating important issues of U.S. policy. The latest Assembly was attended by 73 persons from agriculture, law, business, government, education, communications, the military, the clergy, and other fields. The participants included some of the Nation's leading authorities on food production and population problems. They reached general agreement on a final report.

Their Report Summarized

The following is a summary of their report:

Because death rates have declined dramatically--without corresponding drops in birth rates--the world's population will double by 2000 A.D. More food, especially more protein, will be needed to provide nutritionally adequate diets. In the next 25-30 years, the developing nations will need at least a 4% annual increase in food production.

There is hope that the population by 2000 A.D. can be fed with present technology and continuing research. "But the necessary widespread and effective application of this technology will require major economic, social and political changes in developing countries, and a much larger scale of effort. Such efforts must be accompanied by continuing, concerted and expanded assistance from advanced nations."

Probably for the remainder of the century, most of the increased food eaten by the world's population will come from farm land; most of the food needed by nations with booming populations will come from their own agricultural resources.

The essential elements to eliminate world hunger are:

- "Effective measures to reduce population growth;
- Effective measures to increase food production in hungry nations, and to assure its effective distribution to all persons in the population of each country, with interim food aid from advanced countries;
- Economic, political and social changes in developing countries designed to promote total economic development, without which the above cannot be achieved; and
- Substantial assistance toward all these objectives by the advanced countries."

Recognizing these objectives, the 34th American Assembly went on to emphasize that "effective action is urgently needed now." It recommended the following:

- Programs to reduce population growth should be expanded immediately. Only the success of these and other programs can prevent civil disorder and political collapse. Reductions in population growth rate "are as important in fostering economic and human development generally as they are in reducing the strain on national food supplies."

The present birth-control programs in developing nations should be broadened and new programs begun that emphasize voluntary family planning. The UN and its agencies should assume leadership in these efforts.

- It is urgent that national and international research efforts be coordinated and

expanded. These must focus on the obstacles to increases in productivity and profitability of most crop and animal species in most developing countries.

• The advanced nations should help the developing nations to achieve large increases in:

1. Availability and use of "inputs" into production--improved crop varieties, particularly with higher protein content and quality, water, arable land, and fertilizer, pesticides, and machinery produced locally where possible;

2. "Protein consumption from low cost sources such as fish and oil seeds, as well as livestock and poultry";

3. Enrichment of foods with essential minerals and chemically produced nutrients (vitamins & amino acids);

4. Government and private investment in marketing and processing systems to move food from farm to all countries.

5. Private and public communication media to inform producers and consumers.

• To achieve at least the 4% annual increase in food production, the amount of money (and its effectiveness) invested in developing the economy should be increased greatly.

• The food aid to hungry nations should not retard their agricultural development. Emphasis in the future should be on improving nutrition through more protein and sound economic growth--and less on the amount of food and surplus crop disposal.

• International trade and monetary policies should be changed to foster economic growth in all countries. They should enable developing nations to earn foreign exchange through trade rather than through grants and loans.

• Qualified technical personnel are needed in food production, marketing, and distribution to improve nutrition. "In the long run, first-rate national institutions in each country should meet these needs." U.S. universities can make a unique contribution.

• Hungry nations should provide strong incentives for farmers to adopt production-increasing techniques—incentives such as price guarantees, subsidies, improved seeds, fertilizer, and insecticides.

• To intensify farm production, local and foreign industry should supply critical goods and services.

• "The United States should press for international arrangements to insure that the oceans, outside reasonable territorial limits, be available for the use and benefit of all mankind. We acknowledge the importance of marine products as a source of protein and we urge continued and accelerated research on its economic feasibility and consumer acceptance. It should be emphasized, however, that for the remainder of this century at least, most of the increased food consumed by the world's people will come from farm land."

• The search for new plants and possible uses of wild animal life should be pushed. Playing useful roles are the research centers that are assembling and classifying valuable plant and animal genetic material useful to produce new and improved foods.

• Farmers of developing nations should be encouraged to set up cooperatives.

• All segments of the American public should be made aware of the accomplishments of U.S. foreign assistance--"and of the need for continuing and greatly enlarged commitments of resources to this purpose in the future."

• The U.S. and other nations should give more support to the United Nations and other international institutions in their dealings with agricultural development and population growth.

BCF Defines Continental Shelf Fishery Resources

BCF has identified certain shellfish, crustaceans, and sponges as resources of the U.S. Continental Shelf. These include: tanner, king, and stone crabs; red and pink abalone; Japanese abalone; queen conch; and 4 kinds of sponges.

H. E. Crowther, BCF director, notes that this list is the first of a series. The series will be based on studies being made by BCF scientists and will include other marine animals important to U.S. fisheries.

"Bartlett Act"

A 1964 Federal law, the "Bartlett Act," describes fishery resources of the Continental Shelf as those which, at the harvestable stage, "are immobile or are unable to move except in constant physical contact with the seabed or the subsoil of the Continental Shelf." Under the law, foreign-flag vessels may not take species so defined by the Secretary of the Interior from the U.S. Continental Shelf--except as provided by law or under international agreement to which the U.S. is a party. This definition also is used in the 1964 Geneva Convention on the Continental Shelf; the U.S. is a signatory.

Good Pacific Albacore Season Ends

A series of intense fall storms, some reaching down to southern California, high winds, and heavy seas forced almost all boats fishing albacore to return to their home ports by the end of October 1968, reports BCF La Jolla. Oregon set a new production record in 1968 with more than 41 million pounds of albacore landed--surpassing the 1967 record of 29 million pounds.

Total albacore production for Washington, Oregon, and California will be near 54-56 million pounds. This will make 1968 one of the top 4 years since 1940. Up to the last week in October, Oregon's share was about 76% of the total Pacific coast catch. This reflected a major geographic change in the center of albacore availability.

More Fishing Effort

Although the 1968 catch suggests near-record fishing conditions, this was not the case, say the La Jolla scientists. More fishing was done than in 1967--especially by halibut and salmon boats moving into the tuna fishery because they were having poor seasons. Albacore tuna schools were reported widely scattered this season with very few usual fishing "signs"--"few jumping or breezing fish, few porpoise, few birds, scarcity of bait-fish schools, etc."

Jigboats fared reasonably well, but baitboats reported trouble finding "school fish" that would take live bait. Live bait was scarce in the Pacific Northwest. Many baitboats resorted to trolling and chumming jig lines with frozen and salted bait--rather than make long runs to southern ports where live-bait supplies were adequate. Unfavorable wind and sea conditions also contributed to poor baitboat catches during most of the season, and seriously hampered purse-seining.

Change in Fishery

A price dispute early in the season probably cost the industry about 2 weeks of good fishing in late June and early July. All preseason survey evidence available to La Jolla's Fishery Forecasting group pointed to the earliest appearance of albacore tuna off southern California in the past 3 years. Also, the center of the fishery moved into Oregon-Washington waters. This forced most of the albacore fleet to unload in ports that did not have enough facilities to handle this year's catch. Unloading delays became a major problem during the season's peak in August. About 1 week of prime fishing time was lost to each boat discharging fares in northern ports. Also, while awaiting their turn to unload, some boats that rely on ice refrigeration lost much poundage to deterioration.

Lake Michigan Alewife Catch Declines

The expected 1968 commercial production of alewives from Lake Michigan is about 25 million pounds. It was 42 million pounds last year. Only half the pound nets used in 1967 were operated this year--and there was a corresponding 50 percent drop in pound-net catch.

The reduction in nets was caused by closing of 2 of the 3 fish-meal plants.

Commercial landings of alewives from Lake Michigan since the fishery began in 1956 were:

Year	Pounds	Year	Pounds
1956	400	1963	5,396,000
1957	220,000	1964	11,743,000
1958	1,356,000	1965	14,007,000
1959	1,264,000	1966	29,002,000
1960	2,370,000	1967	42,000,000
1961	3,195,000	1968	1/25,000,000
1962	4,742,000		

1/Estimated figure.

Deepwater Traps Yield Record Landing of New England Lobster

The "Homarus" recently landed more than 10,000 pounds of live lobsters at Gloucester, Mass., a record for a single trip. The trip lasted 8 days; one day's fishing time was lost to bad weather. Fishing began daily with first light and did not go beyond 4:30 p.m.; there was no night fishing.

The Homarus is operated by Deep Deep Ocean Products of Gloucester, which began fishing in May 1968. A second company vessel, the "Red Diamond," recently began fishing. Prior trips by company vessels had not landed more than 5,700 pounds.

"Delaware I" Explored

Successful gear trials and exploratory fishing conducted by BCF's Gloucester Exploratory Fishing Base in spring-summer 1968 demonstrated the harvesting possibilities of this type of fishery. One good experimental catch was made by BCF's Delaware I June 12 on the slope between Shallop and Veatch Canyons in 109 fathoms. Using a string of 11 pots, 89 lobsters weighing 158.5 pounds were taken in 24 hours, an average of 14.4 pounds per pot.

Experimental catches exceeding 4 pounds of lobsters per pot for fishing time of 24 hours or less have been made between 63 and 109 fathoms at various locations, primarily near heads of canyons along the outer edge of Georges Bank. Experimental rectangular trap gear used measured: (1) Type A--40"x 60"x18"; (2) Type B--36"x48"x18".

U.S. Agencies Will Act Quickly When Oil Is Spilled

President Johnson approved on Nov. 13, 1968, a Federal interagency plan to produce quick, united action when oil and other hazardous materials are spilled in U.S. waters. The plan was signed in September by the heads of Interior, Transportation, Defense, and Health, Education, and Welfare.

A National Joint Operations Center for Oil and Hazardous Materials Water Pollution Incidents has been set up at Coast Guard Headquarters in Washington, D.C. It will coordinate Federal action when major spills of oil and other hazardous materials occur. Representatives of the 4 departments will be available at the center when needed.

LBJ Cites 'Torrey Canyon'

President Johnson gave "dramatic and tragic examples" of the damage from oil pollution. He cited the sinking of the oil tanker Torrey Canyon off Britain in 1967--and the tanker "Ocean Eagle" off Puerto Rico in March 1968.

In March, Mr. Johnson asked Congress to hold financially liable the owners and operators of ships and shore facilities for the full cost of cleaning the oil pollution they cause. The Senate and House passed different bills and the legislation died.

When approving the interagency plan, the President said the legislation should be a "high priority item" for the next Congress. He emphasized the "urgent" need for new authority to prevent oil pollution--and to require polluters to pay for their damage.

Japanese Water-Pollution Study Team Visits

A Japanese water-pollution study team visited the U.S. Department of the Interior in Washington, D. C., in November before leaving on a 10-day tour of the U.S. The visit was part of the U.S.-Japan Cooperative Program in Natural Resources.

The program includes studies of common problems concerning "water, air, energy,

wind and seismic damage, undersea technology, and agricultural problems." It began in 1964 with the U.S.-Japan Committee on Trade and Economic Affairs. In October 1967, a U.S. study team of water-pollution experts visited Japan. Other Japanese experts also have visited the U.S.

Team and Tour

Leading the 5-man team was Dr. Kenichi Hanada, Chief, Water Pollution Control Division of the Government Resources Research Institute, Tokyo. Experts of Interior Department and the Department's Federal Water Pollution Control Administration explained the U.S. water-pollution-control program.

After Washington, the Japanese inspected advanced water treatment and research facilities and conferred with officials in Cincinnati, Ohio; Chicago, Ill.; and Portland & Corvallis, Ore.

U.S. Proposes Conservation Measures in Northwest Atlantic

The U.S. announced on Nov. 14, 1968, proposed amendments to regulations on the size of meshes in trawl nets used in the northwest Atlantic fisheries. The proposals were published in the "Federal Register" on Nov. 6 and the public given 30 days to comment.

The amendments followed recommendations of the 14-member International Commission of the Northwest Atlantic Fisheries (ICNAF). All 14 governments, including the U.S., agreed to the changes.

The Changes

The changes extend mesh-size regulations to more species and to previously uncovered areas of northwest Atlantic. New species include ocean perch, halibut, grey sole, yellowtail flounder, Greenland halibut, pollock, white hake, black back sole, and dab.

H. E. Crowther, BCF Director, said extension of U.S. fishing efforts into new Atlantic areas necessitated protection of resources by extending conservation measures. He added that other ICNAF nations are adopting new regulations. (See Canada, p. 75.)

Fishery Products Affected by Airlines' Rate Increases

United Airlines and American Airlines have filed increases in general commodity rates on shipments under 1,000 pounds ranging to 120%, effective Jan. 1, 1969. These will affect fishery products.

Interior Secretary Udall protested the increases and requested an investigation. The National Fisheries Institute (NFI) filed a protest on Nov. 14, 1968.

Other air carriers also are considering rate increases on small shipments.

Catfish Farmers to Meet

Catfish Farmers of America will hold their First Annual Convention on February 7 & 8, 1969, at the Fontainebleau Motor Hotel, in New Orleans, Louisiana.

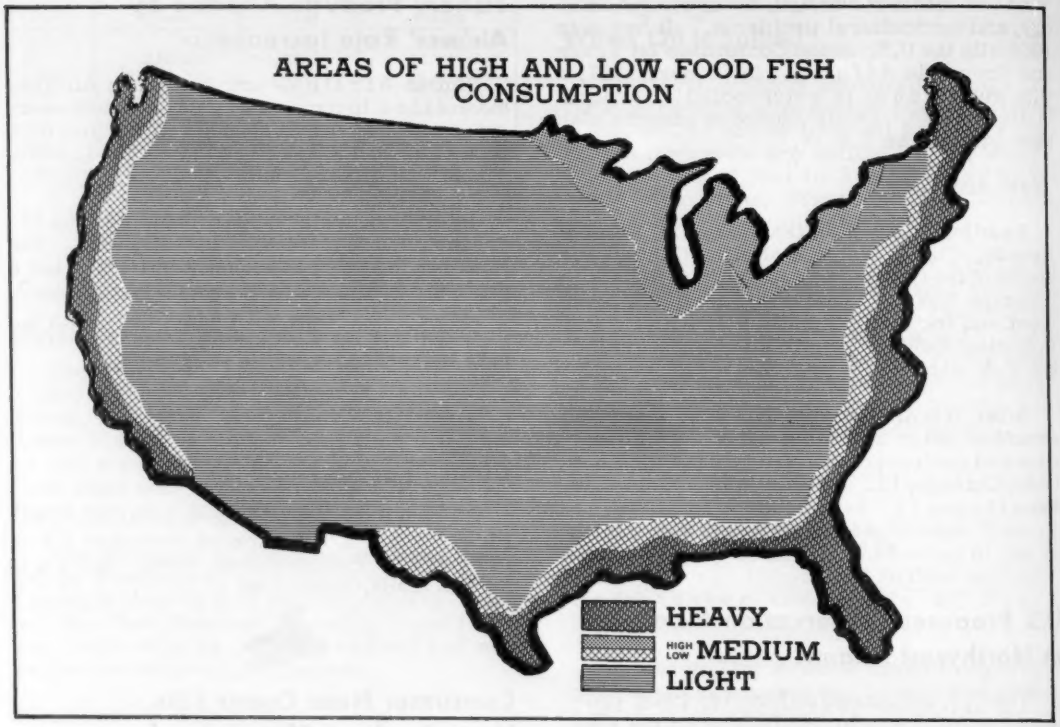
Consumer Near Coasts Eats More Seafood Than Inlander

Year after year, the U.S. consumer eats between 10 and 11 pounds of fish and shellfish. While quantity has remained much the same, the kinds of seafood eaten have changed significantly. Canned tuna has soared in popularity and canned salmon has declined. Per-capita consumption of shrimp has increased, but that of oysters has declined. Prepared and packaged fishery products have multiplied to meet the demand of housewives for seafoods that involve virtually no work.

Regional Differences

Where the consumer lives largely determines how much seafood he eats. If he lives near the coasts, he eats more seafood than the person in the interior U.S. (See chart on p. 14.)

BCF and industry are developing processing methods to enable inland areas to receive better-quality fish and shellfish. BCF is investigating irradiation of fishery products to determine whether fresh fishery products can be kept fresh longer on grocery shelves. Air shipments have increased.



First All-Aluminum Shrimper Will Fish Gulf of Mexico in 1969

The world's first all-aluminum shrimp trawler, an 83-foot craft, will be built by Graham Boats of Pascagoula, Miss., and go to work in the Gulf of Mexico in summer 1969. This was reported by the Aluminum Company of America.

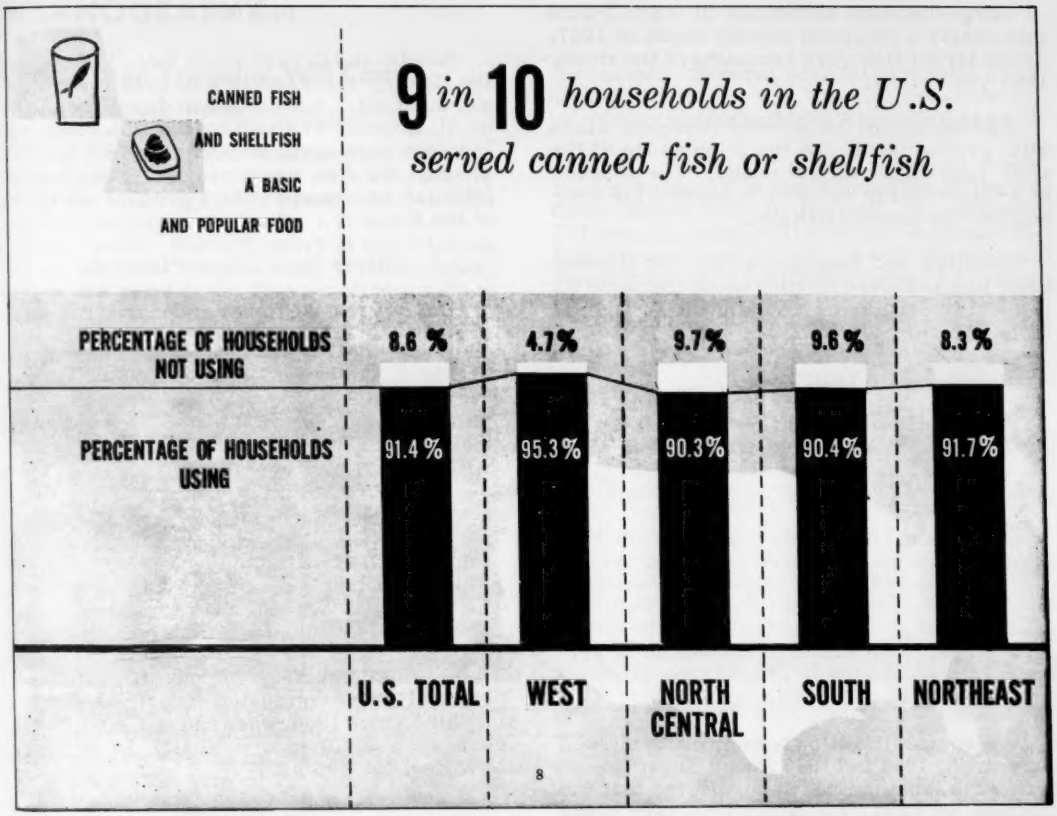
Charles Graham, president of Graham Boats, explained why he chose aluminum for the boat:

"Use of aluminum will result in lower operating costs and permit faster speeds both en route to fishing grounds and homeward-bound with a full load. We won't have to paint or sand blast the boat, thereby reducing maintenance costs. Under peak load conditions, the boat will require less draft than a steel or wood unit. Further, we can safely predict a much longer life for the craft."

The new shrimp boat will be refrigerated and thus permit it to remain in the Gulf for extended periods while maintaining highest product quality. Air-conditioned quarters and pilot house will provide relief to shrimper crews who often work in temperatures of 100 degrees or more. The boat will carry the latest electronic navigational aids. It will be operated by Gulf City Fisheries, Inc., also headed by Graham.

Canned Fish or Shellfish Served in 9 of 10 U.S. Homes

Most U.S. families eat canned seafood, an important protein food. Fish contain about 18 percent protein, which is highly digestible and often recommended in diets for old people. Fish supply 5-10% of the nation's animal protein for people.



Large amounts of canned fish or shellfish are eaten in every part of the U.S., although the kinds differ from region to region.

Good Food

The fats in fish are polyunsaturated, which many researchers believe is important in the human diet. The percent of fat in different fishes varies: from less than 1% for the cod family to 20-25 percent for salmon or mackerel.

Canned fish and shellfish are good sources of B complex vitamins. These include thiamine, riboflavin, niacin, vitamin B_6, and vitamin B_{12}. They also contain useful amounts of calcium, phosphorus, iron, copper, and iodine.

New England Landings April-June 1968 Reported

Groundfish and sea scallop fished by New England fleets during April-June 1968 have been reported by R. L. Schultz and F. A. Dreyer of BCF's Woods Hole (Mass.) Biological Laboratory:

Haddock

Haddock landings from Georges Bank for the first 6 months of 1968 were off about 15 million pounds, and landings per day declined about 3,200 pounds, compared to the 1967 period. This decline in haddock landings and abundance was due to a scarcity of scrod.

Scrod abundance for April-June 1968 dropped 57 percent from 1967, a result of poor recruitment from the 1964 & 1965 year classes.

Large-haddock abundance in April-June was nearly a thousand pounds ahead of 1967. These larger fish were remnants of the strong 1963 year class.

Age compositions showed 1963 year class still predominant, and the importance of the 1962 year class all but ended. The absence of 3-year-olds in the catch suggested the reason for low scrod landings.

Landings and landings per day for Browns Bank haddock were running about the same as in 1967. Large and scrod abundance showed little change.

Yellowtail

Yellowtail landings in first-half 1968 were running about 4 million pounds ahead of 1967. Both Georges Bank and Southern New England grounds were producing higher landings.

Abundance increased on Southern New England grounds compared to second-quarter 1967. Georges Bank yellowtail abundance also was higher. The level of effort on both grounds, though high, was still below previous peak years. With this high abundance of yellowtail and no change in effort, 1968 landings could end close to 65 million pounds.

Age compositions on both grounds showed very strong 1964 and 1965 year classes dominating the landings. It was expected that the success or failure of the 1966 year class would influence the continuance of this increasing trend of yellowtail abundance in 1969. The 1964 and 1965 year classes should continue to contribute substantially to the fishery in 1969.

Cod

Cod landings for the first 6 months of 1968 were about 3 million pounds higher than the 1967 period due to a daily increase. It was difficult to ascertain whether this reflected an increase in true abundance. With haddock relatively scarce, changes in fishing pattern may have been influencing cod-abundance index.

Redfish

Schultz and Dreyer noted that "the state of the fishery for redfish was questionable, to say the least." Landings per day were higher on all grounds fished by the U.S. fleet, yet landings were about the same as 1967's. Obviously the fish were available, but lack of interest has resulted in a gradual shrinking of the fishery.

Silver Hake (Food Fishery)

The silver hake fishery appeared recovered from the 1966 & 1967 labor and price disputes. Landings were ahead of 1967 for the first 6 months. Landings per day were lower on Georges Bank and higher in the Gulf of Maine in 1968, but total abundance remained about same.

Industrial Fishery

Despite increases in red and silver hake catch per day, landings in first-half 1968 remained about the same as in 1967 period. Total industrial landings were running behind 1967. This decrease resulted mainly from reduced landings of species other than hake. These other species, eelpout and flounders primarily, have dominated industrial-fishery landings since 1966, when red and silver hake abundance declined drastically in Southern New England waters.

Sea Scallops

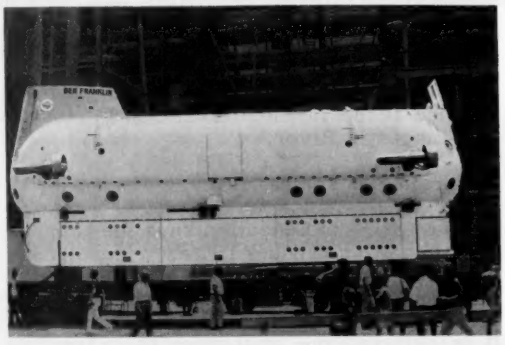
Sea scallop landings from the Middle Atlantic were slightly ahead of 1967 but still far below 1965-1966 levels. Georges Bank landings were very low for April-June 1968. The thing that seems to keep the fishery alive is the price of scallops to the fisherman (1.15-1.20).

The 1967 "Albatross IV" survey showed an increase in scallop abundance. However, it failed to materialize in 1968 commercial landings data. Landings per day have remained low on both grounds.

OCEANOGRAPHY

Drifting 'Ben Franklin' Will Carry Modern Equipment

When the research submarine Ben Franklin begins her Gulf Stream drift mission early in 1969, she will carry the most sophisticated scientific equipment available for oceanographic work. She will start at the Florida end of the Gulf Stream and, 4 weeks later, arrive at a point in the Stream off Massachusetts.



Grumman Aircraft Engineering Corp., Ben Franklin's owner and operator, developed the world's largest nonmilitary research submarine with the help of Jacques Piccard, an authority on deep-diving vehicles. The U.S. Oceanographic Office (NOO) provided most of the sub's scientific equipment. Also, it will send 2 or 3 oceanographers on the mission and provide the surface support ship.

The Mission

The scientists will drift with the Gulf Stream in the 50-foot, 130-ton sub. Data supplied to them by a current sensor system mounted on the top deck will enable them to measure the sub's relative current speed and diversion.

The vehicle has a 36-man-week life-support capability. The scientists will be able to view their surroundings from 2 external camera systems designed to provide stereo photographs of the sea floor--and two 70 mm. cameras integrated into a closed-circuit television system to observe marine life and phenomena. Several bracket-mounted, hand-held, still- and motion-picture cameras will be used to photograph the scientists at work.

The scientists will use a narrow-beam, side-scan sonar to see the outline of the sea floor passed over by the sub. A continuous FM sonar system will monitor obstacles that may be encountered. It will observe and monitor the Deep Scattering Layer--horizontal, sound-scattering bands of marine life that often produce "false bottoms" on the recording traces of echo-sounding devices.

Special Equipment

The scientists will use a water-sensing pod to measure on magnetic tape continuous digital information on temperature, salinity, depth, and pressure of the water surrounding the sub.

A proton magnetometer will provide data on the magnetic field and local anomalies--irregularities in the magnetic field pattern. A transmissometer will measure the light absorbed by one meter of water. It may be able to determine the level of natural light with an ambient light meter, still being developed.

A turbulence measurement instrument is expected to determine fluid velocity by temperature change--and then produce a profile of the current shear (the whirlpool-like turbulence where 2 opposing currents meet) from top to bottom of the sub. An acoustic system will determine continuously the sub's total depth and the total water depth.

Although the sub is equipped with four 25-horsepower AC electric motors, she was designed to be propelled northward along the Gulf Stream by the current itself. This will provide the scientists with a noiseless research and observation platform. The Ben Franklin is expected to hover in midwater for "continuous observations of the same volume of ocean for the entire 4-week mission."

See article by Jacques Piccard, p. 53.

U.S. Exchanges Nautical Charts With Other Nations

The U.S. Naval Oceanographic Office (NOO) exchanges nautical charts on a continuing basis with 48 foreign nations, a 47-year-old tradition. Most of the 48 are members of the International Hydrographic Bureau headquartered in Monaco.

The world-wide exchange was proposed in London in June 1919 at a 25-nation International Hydrographic Conference. Delegates also considered the idea of exchanging "sailing directions, notices to mariners, light and buoy lists, tide tables and other hydrographic (charting and mapping) publications."

Began in 1921

The exchange of nautical charts and other hydrographic publications began in 1921 when the International Hydrographic Bureau, which resulted from the 1919 conference, went into operation. As the major U.S. ocean-charting agencies, NOO and the Coast and Geodetic Survey act for the U.S. in all official matters at the Bureau.

No country can chart the world's oceans covering 70% of the earth's surface. So the exchange, says NOO, provides an effective way for nations to learn the results of surveying activities by other nations.

A Case History

NOO noted that "16 reported dangers of various types" were included in the 1954 edition of a chart of the Gulf of Siam. But after a detailed survey in 1961-62 by the USS 'Maury' and 'Serrano'--2 NOO hydrographic survey ships--12 of the charted shoals were disproved and removed from Oceanographic Office charts.

This information was speeded to the International Hydrographic Bureau, which removed the shoals from its "Doubtful Hydrographic Data." As a result, NOO said, all nations in the Bureau learned that their mariners could "once again proceed (through the Gulf of Siam) on the most direct routes with safety and assurance."

Train Unemployed for Jobs in Oceanography

ESSA's "Explorer" has become involved in a new kind of discovery. She has been transferred to the U.S. Office of Education for use as a floating classroom to train "hard core unemployed" for jobs in oceanography. The 219-foot, 1,900-ton hydrographic survey vessel, launched in 1939, was decommissioned in January 1968.

The Office of Education said the vessel will be towed from Norfolk, Va., where it had been decommissioned, to a berth in Washington, D. C., by Ogden Technological Laboratories, Inc. The firm will establish the curriculum and provide instructors for the $155,000 program. The ship will be berthed at the former Naval Gun Factory on the Anacostia River.

To Train 120 Youths

The Office of Education says the program is aimed at training 120 hard-core unemployed young men between 16 and 22 from the Washington area as oceanographic aides for positions in government and private industry. It is believed the first attempt to train the disadvantaged in oceanography. The 15-month program provides for classes of 40 hours per week lasting 8 to 10 weeks.

Nautical Charts Issued for Alaskan Arctic Coast

The Coast and Geodetic Survey (CGS) has issued 29 nautical charts of Alaska's Arctic Coast following the discovery there of major oil deposits. The large-scale charts are revised editions of those previously published by CGS for the Navy but classified until now. They are based on topographic and hydrographic surveys made from 1945-53 and 1961-62 and provide the most detailed coverage of this area.

What Charts Cover

CGS notes that the charts cover the remote coastal area extending from Point Hope east to the Canadian border. A revised edition of another once-classified chart has been issued for the Cape Romanzof area in western Alaska, south of Norton Sound.

The area covered includes Prudhoe Bay, where large oil deposits have been discovered; Scammon Bay, Point Hope, Marryatt Inlet, Cape Lisburne, Point Lay, Kasegaluk Lagoon, Icy Cape, Avak Inlet, Wainwright, Peard Bay, Point Barrow, Admiralty Bay, Smith Bay, Cape Halkett, Harrison Bay, Camden Bay, and Demarcation Bay.

The Cape Romanzof chart is numbered 9374. Those for the Arctic Coast are 9450 through 9478. They are published at a scale of 1:50,000.

CGS expects the new charts to provide a major assist in developing Alaska's mining and petroleum industries. They may be purchased for $1 from CGS nautical chart agents in Alaska, or by mail from CGS, 121 Customhouse, 555 Battery Street, San Francisco, Calif. 94111.

Biologist Studies Dangerous Fishes

Dangerous marine animals, including fishes that bite and those that sting, are being catalogued according to species, environment, and geography by Florence Rieken, a marine biologist and oceanographer at the U.S. Naval Oceanographic Office (NOO).

As an example of what may be published when enough material is gathered, she said: "We are thinking about presenting updated information on shark attacks in a manuscript, which eventually may be compiled into a technical publication. The article not only would list the shark species known to attack man but also would give the geographic locations of shark attacks along with the seasons the attacks occurred."

Similar manuscripts may be prepared on highly venomous fishes, such as the stonefish and other reef fishes known to sting man. These also would list the species of venomous fishes, environmental factors, and geographic locations.

Sonic Fishes & Mammals

Mrs. Rieken also is compiling information on sonic fishes and mammals, such as porpoises, known to emit sounds, and on schooling fishes, such as herring.

The material on sonic fishes and mammals may be compiled into handbooks for Navy sonarmen. Articles on schooling fishes may help sonarmen. They would be able to use the environmental data to determine if echoes to sound signals are being returned from the schools or from a submarine. Eventually, the information on schooling fishes may benefit fishermen.

Asks for Data

Mrs. Rieken has completed filing the information she collected on dangerous marine and sonic animals. She asks that new data on shark attacks, and poisoning or stinging incidents by venomous fishes, be sent to the Commander of the U.S. Naval Oceanographic Office, Suitland, Maryland 20390, marked for her attention.

Scientists Prepare Worldwide Ocean Chart

The world's oceans conceal rugged terrain and scientists of the U.S. Naval Oceanographic Office (NOO) are charting part of it for the International Hydrographic Bureau. They will complete the project's first phase by January 1969.

The scientists are collecting depth measurements, from soundings, that reveal the ocean-floor contour for Pacific and Atlantic Ocean areas up to 2,000 miles off the North and Central American Coasts. In addition to NOO ships, they are using sounding data observed by naval and merchant ships.

These measurements, plus those collected by the U.S. Coast and Geodetic Survey for two areas--one in Pacific, the other in Atlantic--are the U.S. contribution to a scientific chart being prepared by the International Hydrographic Bureau to show the topography of the world's oceans.

The World Chart

The chart, "General Bathymetric Chart of the Ocean," will have 24 full-color sheets: 16 will provide coverage between the Arctic and Antarctic circles at a scale of 1:10,000,000; 8 at 1:3,100,000 will cover the 2 polar areas.

William Opalski, director of the NOO project, reported: "More than 900,000 soundings have been disseminated to foreign countries for use in the compilation of their plotting sheets for the world-wide bathymetric chart."

The Netherlands, Great Britain, Brazil, and France are coordinating their work with NOO.

The International Hydrographic Bureau has 42 member nations. It coordinates the work of hydrographic (ocean charting & mapping) agencies in its worldwide effort "to produce accurate navigation and scientific charts for mariners and scientists of all nations."

Ocean Bottom 'Profiled' by New Device

A device designed to outline the sediment layers that underlie the sea floor is being tested by scientists of the U.S. Naval Oceanographic Office (NOO), Geological Survey, and Princeton University. They are in the Caribbean aboard the 285-foot, 2,580-ton USNS "Kane," the Navy's newest oceanographic research ship.

The NOO scientists are using an acoustical profiler belonging to the Geological Survey to "investigate the cover of sediments over the substructure" of the Puerto Rican Trench between the Virgin Islands and Curacao.

The Profiler

The profiler, a "sparker," is housed in a mobile unit and is lashed in position to the Kane's upper deck. It is capable of discharging electrical shocks 15,000 to 20,000 feet into the sediment layers beneath the sea floor.

L. E. Garrison, a Geological Survey geologist, explained: "The acoustical energy bursts generated by the profiler are designed to penetrate the sediment layers. Portions of the sound 'sparks' are expected to be reflected from the layers, returned to receiving hydrophones towed 15 to 20 feet beneath the ocean's surface, and recorded on magnetic tape. Recorders can transfer the sonic echoes into graphic profiles that can be visually inspected. By examining the profiles, the scientists, hopefully, will be able to separate the sedimentary layers down to the ocean basement--the igneous or metamorphic rock complex underlying the sedimentary rock structure" that begins in the Puerto Rican Trench 27,000 feet beneath the ocean's surface.

M. W. Buell Jr., NOO oceanographer, stated that the information expected to be revealed by the profiles will be added to data gained from coring and will be "correlated with all the existing data." This information will be incorporated into Navy programs aimed at developing knowledge about the ocean and the sea floor.

Core Samples

Buell added that core samples dredged in the Caicos Island region of the Bahamas are being inspected "to see if the sediment age can be determined in an effort to gain a better idea of the history of the ocean floor." The scientists also are taking samples of the water column to learn more about "the circulation of the subtropical underwater and other significant water mass intrusions" into the Caribbean.

The 'Sparker'

The 'sparker' is capable of generating 200,000 joules (one joule equals one watt-second of energy). Later, when it is merged with the Kane's shipboard system, the 'sparker' is expected to produce 233,000 joules--"the hottest spark ever to be put into the ocean."

Foreign Fishing Off U.S. in October 1968

NORTHWEST ATLANTIC

In October 1968, 177 vessels from East and West Germany, Romania, and Spain were sighted, 8 more than in September.

Soviet: Sixty-seven different vessels were sighted--19 factory stern trawlers, 39 medium side trawlers, 2 factory base ships, 4 refrigerated transports, 2 repair tugs, and 1 tanker. Early in the month, they were concentrated 40-50 miles east of Cape Cod and Nantucket (Great South Channel) catching light-to-moderate amounts of herring. About mid-month, they shifted to areas 30 miles south of Martha's Vineyard and Nantucket, where catch was mostly whiting. A small group spent the month fishing herring on Cultivator Shoals.

Polish: The fleet--3 stern trawlers, 18 large side trawlers, 2 factory ships, and 1 cargo vessel--continued to fish more or less apart from other fleets. Except for one sighting of 23 vessels on northeast Georges Bank, only scattered vessels were observed off Cape Cod and Nantucket. Limited catches of herring were seen.

East and West German and Romanian: One Romanian freezer stern trawler, 38 East German, and 35 West German trawlers and support ships fished herring from 14-50 miles east of Cape Cod and Nantucket.

Spanish: An estimated 12 stern and side trawlers were seen pair trawling on the inner shoals of Georges Bank.

New Fishing Area

Twenty-four East and West German and 5 Polish vessels were sighted 20-25 miles east of Portsmouth, N.H. (Jeffreys Ledge). U.S. fishermen have been reporting foreign vessels there for several weeks.

Gulf of Mexico and South Atlantic

No foreign vessels were reported south of Cape Hatteras, or in the Gulf.

California

Soviet: Five vessels were sighted. Two factory stern trawlers and a refrigerated transport were observed fishing about 25 miles west of Half Moon Bay, just south of San Francisco. A third stern trawler was sighted off the Klamath River south of the Oregon border.

Off Pacific Northwest

Soviet: Twenty-two large stern factory trawlers, 10 processing and support vessels, and 3 exploratory research vessels were sighted: half off Oregon and half off Washington. During the third week of October, most were fishing Pacific hake off Washington. For the third consecutive month, no medium side trawlers were seen; this indicated a Soviet switch to stern factory trawlers in the northeast Pacific.

Japanese: Two long-liners, 2 stern trawlers, and 1 cargo vessel were sighted. (The Japanese press recently reported that 7 trawlers in this area had taken about 50,000 metric tons.)

Alaska

Soviet: Forty-four vessels were sighted. In October 1967, the Soviets fished only ocean perch; this year they fished a variety of groundfishes. Early in the month, their ocean perch fishery centered along the Aleutians, with about 14 stern trawlers and 2 refrigerated transports. About mid-month, the effort shifted into the Gulf; by month's end, only about 5 stern and 2 medium trawlers, and 1 reefer remained off Aleutians.

Five medium trawlers and 1 reefer fished pollock, perch, gray cod, sable fish, and flatfish, just off Continental Shelf edge in central Bering Sea. About mid-month, 5-6 medium trawlers began fishing north of Fox Islands.

Japanese: The winter decline in fishing off Alaska continued; the number of vessels dropped from nearly 80 early in the month to just over 50 at the end. Still, this was more than twice the Japanese effort in October 1967.

The Gulf of Alaska ocean perch fishery was continued by 4-7 stern trawlers. One vessel, processing about 20 tons a day, was bringing 6 to 8 tons aboard in one drag. Three stern trawlers fished ocean perch along Aleutians, and 12 stern trawlers, with one factoryship, were active along the 100-fathom curve in eastern and central Bering Sea.

Fig. 1 - The refrigerated Soviet transport "Arkhip Kvindgi" (Sibir class) with SRTM 8-403 alongside transferring cargo. (Photo: Zahn)

Fig. 2 - Spanish fishing stern trawler "Villalba," owned and operated by a Vigo fishery firm.

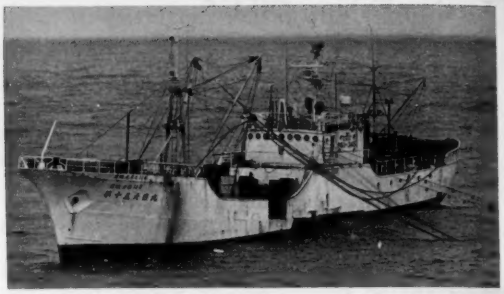


Fig. 3 - A Japanese Danish seiner in eastern Bering Sea. A fleet of 12-15 accompanies a factoryship engaged in production of fish meal, oil, and minced fish meat. In photo, net has been fastened to working gear on foremast and ship is dead in water. (Photo: J. Branson)

The minced fish meat and fish-meal fleets in eastern and central Bering Sea--6 factory ships and 108 trawlers in late September--were reduced to 2 factory ships and 20 trawlers by late October.

The 2-fleet factoryship crab fishery in the eastern Bering Sea ended in October. The first fleet left early in the month; the second followed within 10-14 days. Japanese sources had reported that only 79% of the quota had been reached by mid-September, and that the fishery would have to be extended into October. Since only one fleet fished extensively in October, the quota may not have been achieved this year.

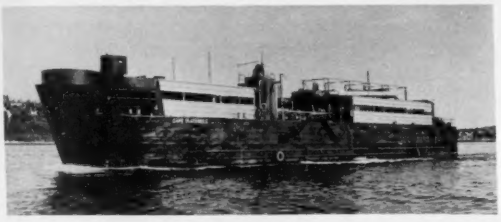
Five Japanese long-liners fished sablefish in the Gulf of Alaska throughout October 1968. One ship, boarded by a BCF agent, was taking about 5 tons daily--95% sablefish and 5% ocean perch.

STATES

Washington

FLOATING FPC PLANT BEGINS OPERATION IN PUGET SOUND

A surplus 196-foot Navy rocket ship has been converted into a floating fish protein extraction plant, the 'Cape Flattery I.' It is based at Neah Bay, Wash., on the Makah Indian Reservation.



The Cape Flattery I.

The plant uses the Vio Bin Corp. process: a solvent is mixed with the fish to extract the oil and water at low temperatures, producing a concentrated protein. The odorless processing aboard ship does not pollute the surrounding waters. The protein concentrate is blown to shoreside milling, storage, and bagging facilities.

The Cape Flattery I will use scrap fish--hake, ratfish, dogfish, and skate. It has the capacity to process 200 tons of fish daily.

For Animals First

At first, the Cape Flattery Co. plant will produce concentrated fish protein as a food additive for pets, fish hatcheries, mink breeders, livestock and poultry, and for industrial uses. Within 6 months, the process will be refined to produce FPC for human consumption. The FPC will be an odorless, tasteless powder that can be stored indefinitely. When added to rice, bread, corn, or other grain and liquid foods, it will provide a protein-rich meal.

U.S. Aid

The plant was financed partially through a $650,000 loan from the Economic Development Administration (EDA) of the Commerce Department. Shareholders invested $500,000. The Makah Tribe obtained a $141,000 loan and grant from EDA to finance construction of a tribal public dock. The new plant employs tribe members.

The former navy vessel was converted by the Marine Construction & Design Co. (Marco) of Seattle. The project began in December 1967 with the dismantling and moving by truck of a practically unused Vio Bin fish-meal plant from Greensport, Long Island.

* * *

3 VESSELS FISH PUGET SOUND HAKE

In late November 1968, 3 vessels--'Radio,' 'Wisconsin,' and 'Voyager'--were fishing for hake in Puget Sound. The Radio was landing its catches, to be made into pet food, at La Conner, Wash., the Wisconsin and Voyager were delivering to a fish-meal plant at Everett, Wash.

Total landings since this season began in October 1968 were about 1 million pounds. Since the fishery began in 1965, it has extended from September or October into May or June of the following year. Seasonal catches have been about:

	Pounds Landed
1965-66	6,200,000
1966-67	10,700,000
1967-68	8,160,000
1968-69 (To Nov. 21, 1968)	1,000,000

* * *

NEW BOOK ON CHINOOK & COHO SALMON

A forthcoming book by Washington Department of Fisheries marine biologist Sam Wright, "The Origin and Migration of Washington's Chinook and Coho Salmon," answers such questions as where these fishes go after leaving their home streams, who catches them, and with what gear.

Wright states that salmon from 2 different river drainages, and often stocks within the same river, rarely show identical patterns of fresh-water residence, downstream movements, growth, ocean dispersions, relative availability, upstream migrations, and

spawning preference. He bases his conclusions on marking and tagging investigations by Washington, Oregon, California, Alaska, and Canadian fisheries agencies.

Wright notes that 1 of 4 chinook and coho salmon caught in Washington waters during 1968 (and 1969) will be examined for missing fins or other markings by the Department of Fisheries. Caught salmon may carry a tag (disc or loop type) affixed early in their lives. They may have a very small, coded, magnetic-wire tag in the snout. Or, having been fed chemical compounds when young, they bear identifying "rings" on their bones.

Sport vs. Commercial?

He says the common opinion that sport and commercial fishermen compete directly for salmon is often not true. The commercial salmon trollers often fish isolated grounds outside the 1-day range of coastal ports. By the time ocean sport fishing reaches its maximum, many trollers have switched gear and are searching offshore waters for albacore. Also, many shallower, confined coastal waters are essentially sport fishing "preserves" because efficient trolling is not practicable.

As knowledge of salmon grows, Wright adds, rules about commercial net fisheries and fresh water sport fisheries become complex, often difficult to understand. This is simply evolution toward maximum economic and recreational use of each stock--plus the provision of optimum escapements to perpetuate the resource.

In Puget Sound, net and sport fishermen often operate in same area concurrently, but the fishes caught differ in size, maturity, and habits. Backbone of the sport chinook and coho catch is the feeding, immature fish that will strike the lure or baited hook. These fish offer good sport, but they would often have little commercial value. The larger, mature chinook and coho returning to Puget Sound streams have ended their active feeding by the time they reach inner Sound waters. So only a few of the many thousands passing through can be taken on sport gear. On many occasions when large hatchery-produced runs have passed through intense sport fisheries, only an insignificant number were taken.

Wright describes chinook and coho movements from several Pacific Northwest streams:

CHINOOK SALMON

Columbia River: Lower River fall-run chinook move northward and contribute to British Columbia troll fisheries off west coast of Vancouver Island; few are taken south of Central Oregon or north of Vancouver Island. Amazingly, the largest numbers occur off north Washington and in Strait of Juan de Fuca; fall-run chinook caught here are much more likely to be of Columbia River origin than those caught off mouth of Columbia itself.

Winter, spring, summer, and upriver fall chinook from the Columbia tend to migrate further north in much greater numbers. The indications are that many move offshore to feed in the Gulf of Alaska. Ocean catch distribution is around 75% off Alaska and British Columbia, and 25% off Washington.

Coastal Streams: Chinook from Washington coastal streams move northward; over 75% of ocean catch is off British Columbia and Southeastern Alaska. "Contrary to popular belief, only a small number are taken offshore of Grays Harbor."

Puget Sound: Fall chinook from its streams also move northward; a minor part goes south. The ocean catch is about 90% off British Columbia and Southeastern Alaska, 10% off Washington. However, large numbers remain inside Puget Sound for appreciable periods; these immature feeders contribute importantly to sport fisheries. When they move seaward, they are less available to the ocean fisheries than several other major stocks; a greater percentage escapes the ocean fishery and returns to Puget Sound--to be exploited by commercial net and sport fisheries.

COHO SALMON

Columbia River: Coho show pronounced movements to the north and south but the latter dispersion is dominant. Off Washington, they become steadily less abundant from south to north; abundance reaches a low north of Cape Flattery. The southward movement--more extensive and lengthy--makes these stocks vitally important to fisheries off California and Oregon. These fisheries depend on a single age class or brood year during each fishing season, so the annual catches fluctuate more violently than with chinook; there, annual

production is masked by the various ages and stream residence categories entering the catch.

Coastal Streams: Coho produced in Grays Harbor and Willapa Bay tributaries differ markedly from their nearby Columbia River counterparts. They disperse primarily to the north; ocean harvest is mainly in fisheries off central and northern Washington. Sizable numbers move off Vancouver Island and are exploited by the Canadian troll fleet. Returning adults enter the commercial net and river sport fisheries. The harvest of precocious males, or 2-year-old "jacks," reaches significant proportion only in the river anglers' creel.

Puget Sound: Again, significant coho migrations occur north and south in the ocean. Their abundance declines steadily from south to north along Vancouver Island's west coast and north to south along Washington. As a result, the catch is divided about equally between the fisheries of Washington and British Columbia. These stocks also contribute to Washington and Canadian net fisheries in the Strait of Juan de Fuca--and to Washington's Straits sport fishery and net and sport fisheries in inner Puget Sound. They differ markedly from other coho stocks. Many remain in Puget Sound and never migrate to sea; they form backbone of the sport fishery. The drainages nearest the available foraging (and fishing) areas often contribute most to the catch.

Wright concludes that it is possible to estimate with reasonable accuracy the major coho stocks contributing to Washington's salmon fisheries on an annual basis. Unlike chinook, the major stocks are much more likely to originate in drainage systems near each fishery. Several interrelated factors are responsible for this. On the average, cohoes spend much less time in the ocean due to their younger age at maturity, so their migration distance tends to be much less than the chinooks. They also show random dispersions to north and south, unlike the dominant northward movements of chinook. And, probably most important, their "catchability" or susceptibility to hook-and-line gear does not lessen as quickly as fall chinook approaching their home streams.

Oregon

RECORD SHRIMP CATCH

In 1968, 41 shrimp boats fishing off Oregon landed a record 11,000,000 pounds in Oregon ports, reports the Oregon Fish Commission. In 1967, 10.4 million pounds had set a record by a substantial margin. During the past 10 years, the annual average catch in Oregon waters has been only 3.5 million pounds.

Landings might have gone even higher in 1968 except for interruptions from bad weather and a cost-price squeeze in May, June, and July.

A very strong 1966 year class comprised well over 60% of the 1968 catch. It was the major contributor to the record.

The Shrimp Beds

Typically, shrimp beds are the green mud bottoms 4 to 20 miles off the coast. Beds off northern Oregon and near Coos Bay have been especially productive during the past 10 years.

In 1968, however, the Port Orford bed stole the limelight. It set a new catch-per-effort record for the Pacific coast, except for Alaska.

Coos Bay accounted for more than 4 million pounds. It was high port for 1968. Astoria landings were 2.3 million, and Port Orford's 1.3 million pounds. Newport landings, partly from a bed located during a Fish Commission shrimp cruise in spring 1966, reached 2 million pounds. Other significant shrimp beds are offshore near Brookings and Garibaldi.

* * *

SPRING CHINOOK HATCHERY RETURNS SET RECORD

In 1968, a record 41 percent of the spring chinook escapement over Willamette Falls returned to the Oregon Fish Commission's Willamette and Marion Forks hatcheries, reports Ernest Jeffries, commission fish culture director. Commission hatcherymen estimated the total return to the 2 hatcheries of 12,800 fish. In recent years, up to 30% of this run returned to the 2 stations.

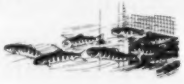
Nearly a third of the estimated 31,500 spring chinook passing over the falls returned to the Willamette Hatchery alone, a remarkably high hatchery return for spring chinook.

10,000,000 Eggs

From the fish arriving at Marion Forks and Willamette, commission hatcherymen took more than 10 million eggs. The bulk of the spring chinook eggs are taken at the Willamette and Marion Forks hatcheries, and at 2 other Willamette tributary hatcheries, McKenzie and South Santiam. Together, the 4 hatcheries rear about 5 million spring chinook each year for release into the Willamette system.

Reason for Hatcheries

The Willamette and Marion Forks hatcheries were constructed by the U.S. Army Corps of Engineers to compensate for fish losses caused by construction of Detroit and Lookout Point Dams. The Corps provides the bulk of the annual operating expenses.



Alaska

OIL POLLUTION CONTINUES
IN COOK INLET

"Oil pollution incidents continue to occur at an alarming rate despite the joint-pollution-control efforts by State and Federal conservation agencies," reports BCF Juneau.

On Oct. 23, 1968, a break in Shell Oil's pipeline from Platform "A" occurred on Middle Ground Shoal. It spread an estimated 1,000 barrels of crude oil over Cook Inlet waters off Kenai. The Federal Water Pollution Control Administration (FWPCA) reported the oil spread over an area 30 miles long and 6 miles wide. The pipeline, the Inlet's oldest, has been the source of several oil spills in recent years.

9 Unreported Incidents

Also, surveillance and patrol flights over the Inlet during October 1968 by BCF, Bureau of Sport Fisheries and Wildlife, FWPCA, and the Alaska Department of Fish and Game revealed 9 incidents of pollution that had not been reported voluntarily by industry.

"The full impact of oil pollution on the important fish and wildlife resources of Cook Inlet is unknown," BCF Juneau states. However, in early October 1968, conservation officials picked up 115 guillemots and 4 murres along 6 miles of beach south of Anchor River. It was estimated that about 250 dead or dying birds could have been recovered. In addition, mallards and pintails taken in the Redoubt Bay area showed signs of exposure to oil pollution.

Texas

HATCHERIES PRODUCED
16 MILLION FISH IN FY 1967-68

Texas Parks and Wildlife Department fish hatcheries produced and distributed 15,942,693 fish during fiscal year 1967-68. This is 14 percent above the 13,986,413 fish in the 1966-67 fiscal year.

The cost of rearing and distributing each fish was 2.37 cents for the 1967-68 period, compared with 2.05 cents in the 1966-67 period.

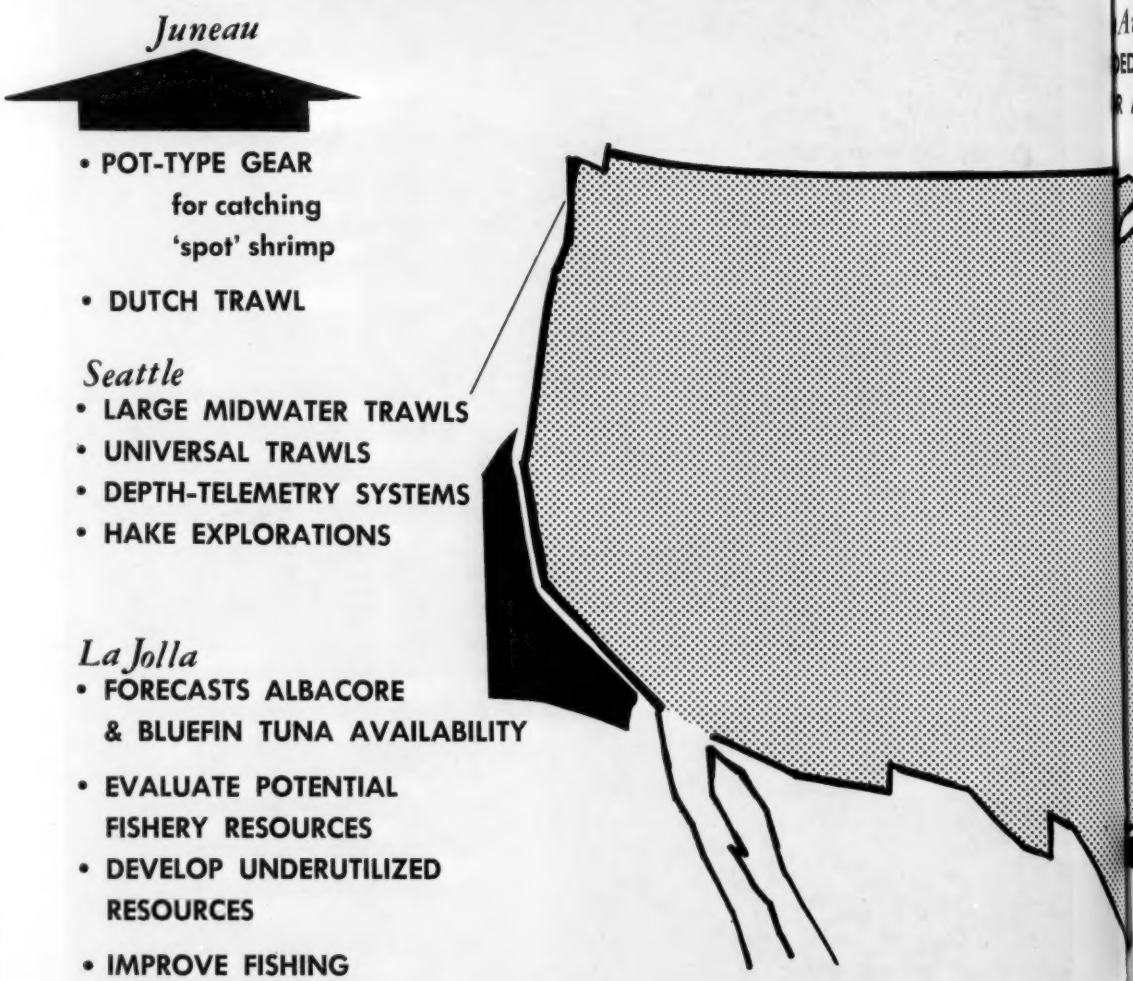
Types and numbers of fish were: Black bass, 13,090,760; warmouth bass, 108,000; sunfish, 112,915; channel catfish, 2,191,388; flathead catfish, 2,100; black crappie, 97,675; white crappie, 49,530; hybrid sunfish, 226,675; and blue catfish, 63,650.

Cod end coming over rail of BCF's research vessel 'Silver Bay' during bottom-fish explorations off Florida. (Photo: J. B. Rivers)

BCF'S VERY LONG LINE

BCF casts a vibrant line that connects the commercial fisherman's catch in the ocean, gulf, and inland waters to consumers across the U.S. Strung along it are BCF responsibilities to find fish; devise the best ways to catch and keep them wholesome until port is reached; study the most economical ways of unloading, freezing, processing, and distributing them to the Nation's consumers; provide data to the industry on the kinds and prices of fish, and where and when they are available, so that industry can make informed decisions; and provide information to the public ranging from price to preparation of fish.

BCF supplies loans to the fishing industry, helps train scientists, and connects the U.S. with other nations to protect several fisheries and the U.S. fisherman's interests.

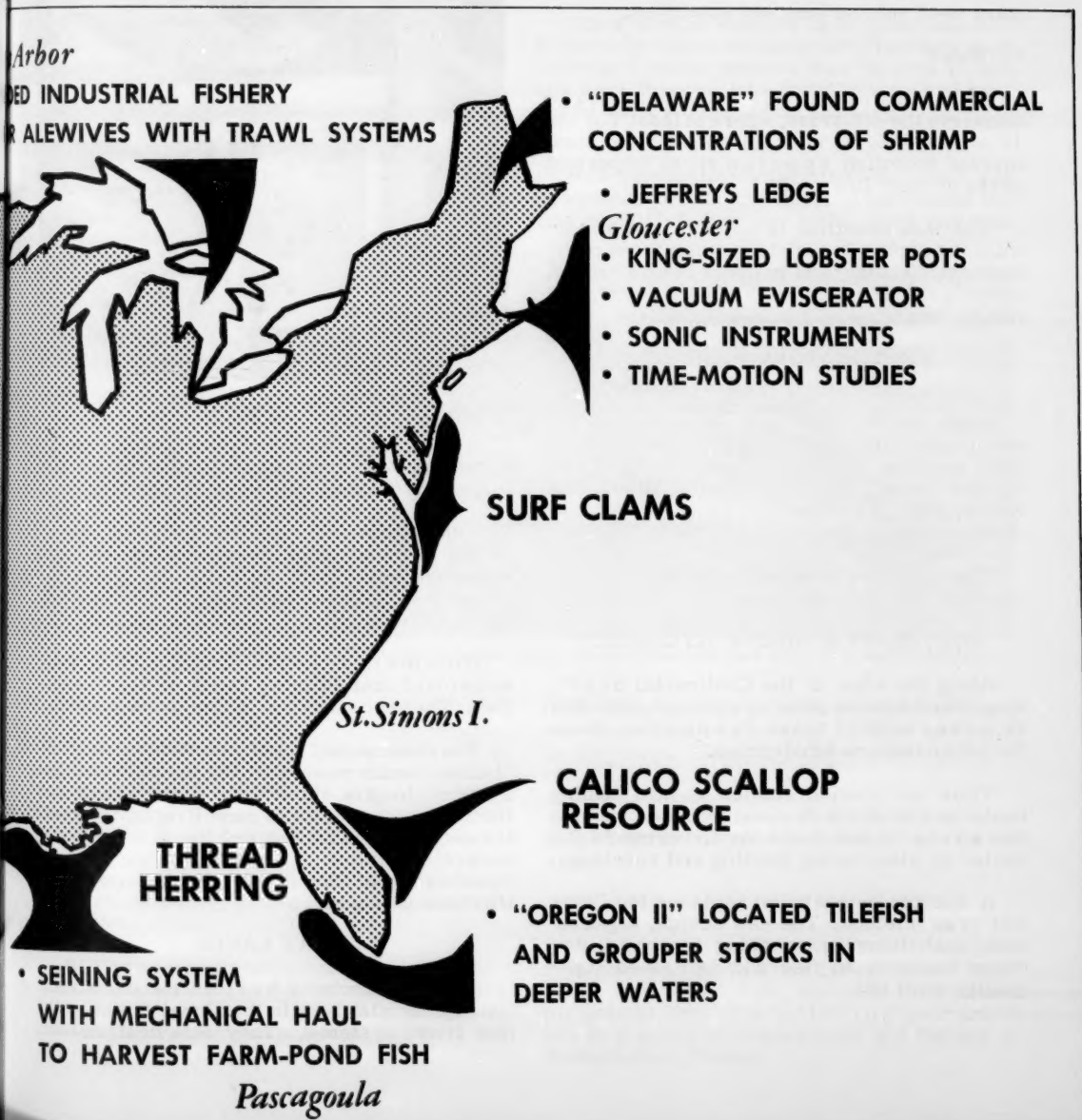


Vast Responsibilities

BCF's responsibilities begin with the inland waters and the sea. Its scientists sail aboard modern oceanographic vessels from Woods Hole, Mass., Miami, Fla., La Jolla, Calif., Seattle, Wash., and Honolulu, Hawaii, to study the physical quality of the sea and the plants and animals in it. They study species of fish off U.S. coasts and gather information on size of fish resources, rates of decline or increase, and the effects of large catches on a fish population.

Achievements

BCF explorations have found unexploited stocks of fish and shellfish large enough for profitable commercial fishing; concentrations of sablefish, Pacific ocean perch, and hake off the Washington coast; shrimp beds in Alaskan waters, off South America's northeast coast, and brown shrimp off Florida's east coast; surf clam grounds off the mid-Atlantic coast; and chubs in the Great Lakes.



When new sources of fish are found, BCF specialists study the type and size of vessel and gear most suitable for catching the fish. BCF's midwater trawl catches commercial quantities of formerly underutilized species; it is expected to expand fishing for the Pacific Coast fisherman. BCF improvements in the shrimp trawl may make daytime trawling profitable. Its scientists have used underwater television to develop gear and adapted the telemeter to midwater trawl fishing. They have used submarines and satellites.

On Shore

On U.S. shores, BCF scientists work to conserve the estuaries, where at least 7 of the 10 most valued commercial species and most marine sportfish species spend important parts of their life cycle.

The U.S. coastline is important to a half-million people whose living comes from commercial fishing--and to sport fishermen, waterfowl hunters, boaters, swimmers, and nature lovers.

EXPLORATORY FISHING & GEAR RESEARCH

Basic to the vast BCF operation are the exploratory fishing and gear research of 6 field stations at: Gloucester, Mass., St. Simons Island, Ga., Pascagoula, Miss., Ann Arbor, Mich., Seattle, Wash., and Juneau, Alaska. These centers publish their findings.

The following are some recent achievements of the field stations:

NORTHEAST & MIDDLE ATLANTIC

Along the edge of the Continental Shelf, king-sized lobster pots have proved effective in waters 10-15 times deeper than those fished by inshore lobstermen.

Time-and-motion studies aboard fishing boats have led to the development of conveyors and sorters that make the fishermen's job easier by eliminating bending and reaching.

A vacuum eviscerator replaces the "rip-and-grap" method. The new device, together with much-improved washing devices, reduces bacteria on fish and increases high-quality shelf life.

Fig. 1 - The vacuum evisceration technique.

A leakproof, insulated, nonreturnable container enables processors to ship fresh fish longer distances than ever before.

The "Delaware" explored for surf clams in the western Atlantic between the state of Delaware and False Cape, Virginia. She found large beds south of the existing commercial fishing areas.

Commercial concentrations of shrimp were found near Jeffreys Ledge south of Casco Bay. These boosted the Maine shrimp catch.

The Gloucester, Mass., staff developed an "independently powered sonic instrumentation system" to give shipboard recordings of the fishing performance of New England otter trawls. The staff measured the trawl nets of several commercial vessels during fishing operations. The measurements may help increase catches.

GREAT LAKES

BCF researchers helped the industrial fishery for alewives in the Great Lakes with new trawl systems. They also designed an

electrical trawl device for harvesting alewives. Test catches were 28% higher than those of ordinary trawls.

Increased commercial harvest--and introduction of salmon--may reduce alewife die-offs and restore the fish population balance.

BCF is conducting programs to promote the growth of the catfish industry: "gear and harvesting research, technological development, quality improvement, and Federal aid programs."

Its researchers have developed a mechanized haul seine to harvest catfish effectively. It works well with conveyor equipment used to load fish into trucks for shipment. The seine is efficient in large and small ponds down to 8 feet.

GULF & SOUTH ATLANTIC

BCF vessels discovered thread herring stocks in the Gulf of Mexico. Its staff is cooperating with industry in the northeastern Gulf to promote a new industrial fishery for this and other sardinelike species.

BCF's new "Oregon II" located stocks of tilefish and groupers in the Gulf's deeper waters.

Other Bureau vessels have found concentrations of calico scallops off Florida's east coast in 3 areas between New Smyrna Beach and Fort Pierce. Interested groups are trying to start a commercial fishery.

PACIFIC NORTHWEST

BCF exploration determined the areas and abundance of Pacific hake. This helped the commercial fishermen make good catches.

Fig. 2 - Nylon haul seine developed by BCF is stacked on pontoon barge and ready to set over stern roller. It is used in harvesting catfish from farm ponds.

Demonstrating Seine

During first-quarter 1968, 10 harvesting demonstrations with the mechanized seine were run in farm ponds in the Arkansas-Mississippi delta region. More than 200,000 pounds of fish were taken from 340 acres.

A truck-mounted line hauler is being tested "to develop a safe, efficient, and compact harvesting system."

BCF is providing information on plant design and sanitation to new processing plants in Arkansas and Mississippi. It is gathering data on the present and potential markets for catfish.

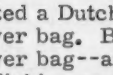
BCF-developed large midwater trawls and a precision depth-telemetry system are used by industry. The trawls have contributed to record catches of hake.

A "universal" trawl that can fish at midwater depths--and on the bottom--has tested well.

ALASKA

Researchers sought the most efficient pot-type gear for catching large-sized "spot" shrimp, the best bait, and best time period for pots to fish. Their fishing-gear trials led to a small commercial pot fishery in Southeastern Alaska.

They also tested a Dutch trawl, which has an upper and lower bag. Bottomfish and debris enter the lower bag--and shrimp the upper bag. Test fishing was encouraging: no shrimp were caught in the lower--and no bottomfish, crab, or debris in the upper. This trawl may become a useful device in the fishery for small pink shrimp.



Sonar Studies Pacific Skipjack Tuna

The scientists of BCF's Honolulu (Hawaii) Laboratory are conducting an unusual and far-reaching investigation: Not to find a fish, or a school of fish--but the population of a small tuna, Katsuwonus pelamis. It is called skipjack tuna in English and aku in Hawaiian. It is caught around the Hawaiian Islands throughout the year. The best catches have been made in summer when schools of large fish appear. Carefully kept records for the past 20 years show that 53 percent of the average annual catch of 5,000 tons is made in June, July, and August. Annual catches have ranged from 6 to 16 million pounds.

It has seemed probable to the lab's fishery scientists that, in addition to the local skipjack tuna, the Hawaiian fishery is drawing upon a migrant population--one that visits the islands in greatest numbers in summer. The scientists have concluded that these "season" fish are part of a large population resident in the central Pacific Ocean.

They assume that one of main spawning grounds of the skipjack tuna is south and east of Hawaii in the equatorial central Pacific. Fish spawned there migrate to the west coast of central America and Mexico; there several thousand tons of young fish are harvested annually. Within a few months, the scientists' assumption is, the skipjack turn westward again, returning to the central Pacific.

Several lines of scientific investigation led to this hypothesis. They pointed to the probability that the central Pacific has a very large population of skipjack tuna--and the only fishery there, in Hawaii, takes only a minuscule amount.

The Honolulu scientists forecast a yield of 100,000 tons if this skipjack population can be fished. That catch would be worth about $25 million a year to the fishermen, $62.5 million after processing, and $100 million at retail level.

The Operation

The lab was charged with the basic scientific studies required to bring this great resource into production. It equipped one of its research vessels, the "Townsend Cromwell," with a "complex, sensitive, and powerful electronic device, a continuous-transmission, frequency-modulated (CTFM) sonar to study the movements of tunas in the water." The sonar emits a sound signal whose reflection by a solid object--a tuna or tuna school--permits the operator to plot the ship's distance and direction from the object. The sonar resembles radar: the radar signal is an electromagnetic wave, but the sonar uses sound waves.

Complementing the sonar is a 14-channel electronic device that records the sonar's information. These data are automatically converted for analysis on large computers. So a tuna becomes "an echo picked up by the sonar (appearing on sonar screen as a point of light), a number in analog form on magnetic tape, a number in digital form on another magnetic tape and, eventually, Arabic numerals on a computer printout."

What They May Discover

With such information, says John C. Marr, BCF's Hawaii Area Director, the scientists will be able to determine the ways tunas move about. Now, most knowledge is obtained from sightings by fishermen when the fish ascend to the surface in pursuit of prey. "How long the schools remain at the surface, to what depths they descend, whether they maintain a schooling formation at night, how long a school lasts as a school (some scientists believe it may be throughout the lives of the fish), the routes they travel in the central Pacific--all this information, and more, will become available."

So far, most of the work has been done in Hawaiian waters because the operators of the equipment have been getting used to it.

Sonar Detects Sonic Tags

The scientists also are using the sonar as passive equipment. They are listening for a special sound: one emitted by a "sonic tag," a small sound transmitter attached to a

fish. The tag now being used is 3 inches long and an inch in diameter. It broadcasts a sound pulse every second. The scientists have used the tag on little tunny (kawakawa) and on a shark. They were able to track the shark for 18 hours, the little tunnies for shorter periods. They hope that development of the tag will enable them to track tuna schools through the depths for longer periods.

By determining the behavior of individual tunas and tuna schools in Hawaiian waters, the BCF scientists expect to gain the information they need to design gear that will make possible the development of this great potential resource.

BCF Has Only U.S. Drift Buoy Program

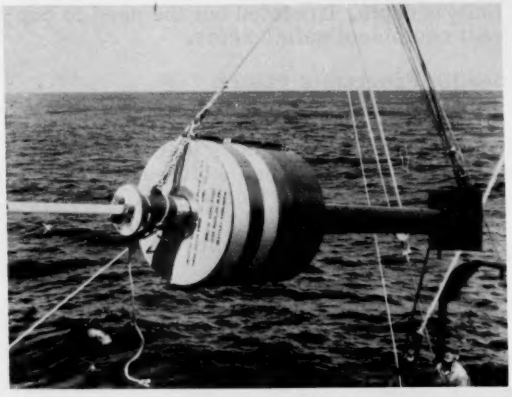
BCF has the only drift buoy program in the U.S. The program will operate from the Bureau's Seattle, Wash., Biological Laboratory with 7 operational buoys. One buoy is completely equipped with communications features that would have provided data transfer through the NASA NIMBUS satellite--but the satellite was lost at launch. The buoy now is on standby. Equipped with 8-10 sensors and the telemetry equipment needed for satellite communication, it costs about $60,000.

Needed for Program

The Seattle scientists explain the need for a drifting buoy system: Oceanographic surveys describe general patterns of circulation and distribution of water properties and organisms. However, such environmental conditions as gradients, and maximum and minimum values of water properties, can be more important to life in the sea than absolute values taken at one time and place, or seasonally biased average values. No reasonable expenditure of ship time, money, and manpower is likely to provide the detailed, 3-dimensional, synoptic, physical-chemical-biological coverage of the ocean required for marine fishery research. This is the reason BCF has developed its drifting buoy system. There is no doubt that most of the volume data gathering in the oceans will come from moored and drifting buoys--transistors turn out to be far cheaper than vessels. This application releases vessels to be used for other functions that cannot be instrumented.

The Buoys

Currently, 2 buoys are instrumented to measure temperature, depth, and salinity--and to telemeter data to research vessel or shore laboratory by HF telemetry link. The accuracy of measurements that can be expected from the sensors on these buoys is plus or minus 0.05° C. for temperature, and plus or minus 0.05 parts-per-thousand salinity. The accuracy with which the drifting buoys can be located is within 5 miles under optimum conditions, but it can range up to 30 to 50 miles when the buoys are far from shore. With satellite positioning, the accuracy is expected to be plus or minus ½ mile.



BCF Telemetry Buoy.

Sensing Units

The sensing units are inductively coupled to the cable attaching them to the buoy and contain their own power supply. A programming unit within the buoy samples the sensors on remote command from shore, or according to a pre-set schedule. Data are recorded on magnetic tape in binary format for transmission when the buoy is interrogated. A 25-watt transmitter, with power pack capable of up to one-year operation, transmits the data in response to a coded tone sequence.

Navy's TRANSIT System

Participation in TRANSIT, now the Navy Navigational Satellite System, is under consideration. Under this system, satellite orbits any buoy positions will be tracked at Seattle. When there is a favorable pass, the buoy will be switched to receive the satellite signal. Doppler shift will be received,

counted, digitized, and transmitted on interrogation. All satellite orbital control, refraction correction, and computation will be conducted at the land station--and only relatively inexpensive receiving and counting equipment will be required on each buoy.

Instrumented Buoy Tested

A 30-day operational test of a fully instrumented buoy began Sept. 13, 1968, when the BCF research vessel "George B. Kelez" placed a buoy in Puget Sound. The buoy was anchored for purposes of the test. This test, only partially successful, was designed to determine the capability of new sensing units to provide data on water temperature and salinity at depth. It pointed out the need to correct equipment deficiencies.

Seattle Program's Future

As the scientists look to the program's future, they visualize buoys placed at random in the Gulf of Alaska and southward along the coast from Alaska to Washington. Eventually, the buoys will be placed according to a fixed plan.

Fish Pump Will Improve Brailing Operation

In the California wetfish (industrial) fishery, brailing--transferring catch from purse seine into vessel's hold--seems costly in time and labor. Many foreign fisheries use pumps to replace the brailing operation.

To aid the wetfish fishery, BCF's Fishery-Oceanography Center at La Jolla, Calif., has bought a rebuilt Marco Capsulpump. The pump will be installed in several California seiners for short trial periods.

Improvements Sought

The BCF researchers hope to demonstrate that mechanization of brailing "can permit a reduction in crew size, an appreciable saving in time, and a superior condition of the fish." The pump should enable 3 men to handle 100 tons of fish per hour; without the pump, 4 men brail about 25 tons an hour.

Like Finding A Fish in the Ocean

In July 1968, G. F. Kelly and C. F. Bocken of BCF's Woods Hole (Mass.) Biological Laboratory, went on a field trip to Eastport, Maine. Their purpose was to sample the population of redfish and to examine any tagged fish that might be caught.

Although they saw many tagged redfish in the water, most of the 250 caught were untagged. But one had been tagged in July 1956! During 12 years of freedom, the fish had been recaptured 3 times before.

It had grown 8 cm.--a rate of about $\frac{3}{4}$ cm. a year. The fish was in excellent condition and was returned unharmed to the water.

Woods Hole Aquarium Draws Record Crowd

During the 86 days it was open to the public this summer--June 15 to Sept. 8--the BCF Woods Hole Aquarium received a record crowd of 267,200 persons. This is 7,000 more than the record set in 1966. Average daily attendance was 3,130.

BCF-Produced Film Wins Award

The motion picture "Mullet Country" won a silver award at the International Film and TV Festival of New York on Oct. 18, 1968. The film was produced by BCF with funds provided by Florida under Public Law 88-309.

TV Documentary to Include Miami Lab's Shrimp Culture

Experiments in shrimp culture conducted by BCF's Tropical Atlantic Biological Laboratory (TABL) in Miami, Fla., will be seen on TV this winter in the American Broadcasting Co. series, "Man and his Universe." The ABC crew visited TABL October 7 and 8 and filmed aquaculture scenes inside the lab and the shrimp grounds nearby.

Florida's Calico Scallop Resources Are Evaluated

The calico scallop beds off Florida's east coast are "too dynamic," says BCF's Branch of Exploratory Fishing, to be able to find commercial concentrations consistently in the same area. Maximum concentrations are distributed between the 15- and 25-fathom depth contours from Fort Pierce to slightly above Daytona Beach.

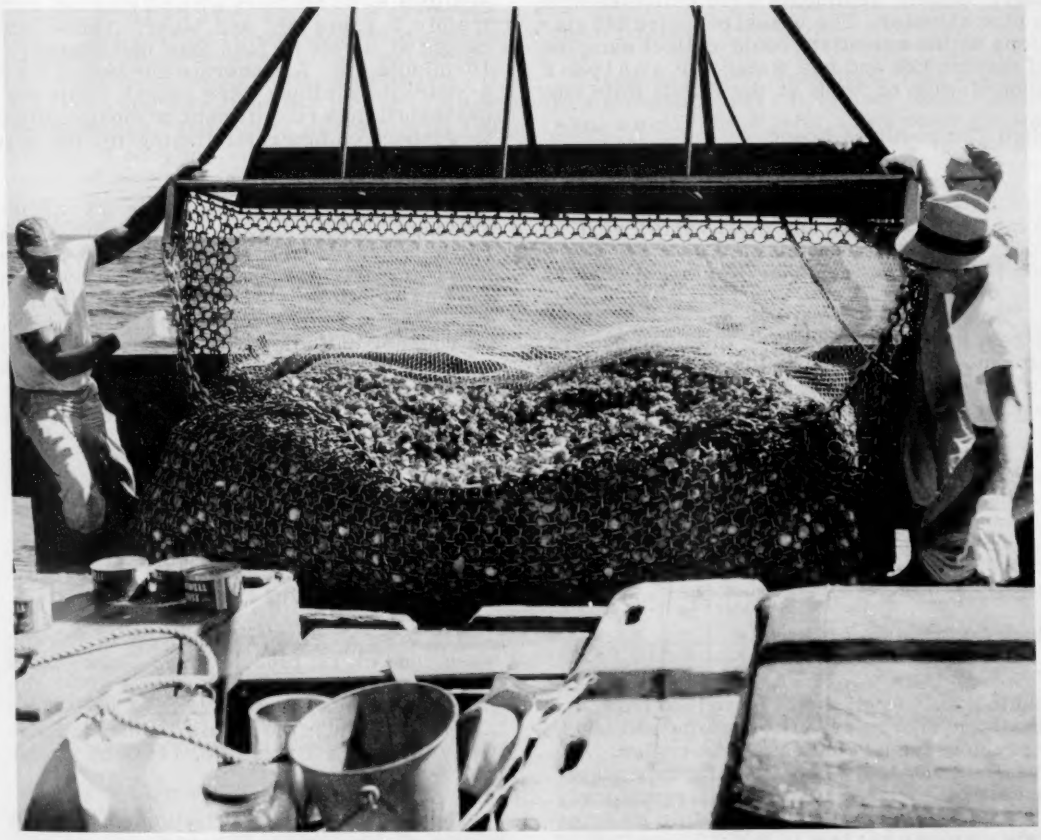
No Definitive Pattern

The area has no "definitive pattern"--except that scallops occur in bands and patches. Each patch reaches commercial size and maximum yield at different times. These depend on depth, probably influenced by water temperature, and north-south distribution.

1,200 Square Miles

The size of the calico-scallop bed is estimated at 1,200 square miles. In any month, 5-20% of this area has commercially exploitable stocks.

"The estimated growth rates of scallops are rapid and the life cycle short. The factors causing and affecting spawning, distribution, and mortality are matters of speculation at this time."



Fishermen on BCF research vessel "Silver Bay" prepare to dump catch of calico scallops on deck during exploratory drags off Florida. (Photo: J. B. Rivers)

'AlbatrossIV' Studies Bottom-Dwelling Invertebrates Off Northeast Coast

A major recent project of the scientists of BCF's Woods Hole (Mass.) Biological Laboratory was a cruise aboard the Albatross IV to the Gulf of Maine-Georges Bank region to study the benthic (bottom-dwelling) invertebrate communities. The localities they sampled most intensively were in relatively shallow (15-60 meters) rocky-bottom areas off Maine and Massachusetts, western Nova Scotia, and deeper areas near Browns and Georges Banks.

Benthic fauna samples were collected primarily with a 1-meter naturalist's dredge--and at selected communities with a sea-scallop dredge, quahog dredge, and bottom skimmer. Bottom sediments were collected with a pipe sampler. The vessel occupied 243 stations so the scientists could collect samples of marine life and sea water for analysis aboard ship or back at the Woods Hole lab.

Rich Communities Found

The scientists came across more than 15 communities of benthic invertebrate animals. Some of the richest and most varied were in rocky areas along the Maine Coast, off western Nova Scotia, and near Nantucket Shoals.

"Sponges, tunicates, sea anenomes, starfishes, hydroids, and other organisms were present in enormous quantities in these localities. Dense beds of small bivalve mollusks (Astarte spp., Venericardia borealis) were common in muddy bottom areas along the Maine Coast. Swarms of amphipod crustaceans were present on Stellwagen Bank and Nantucket Shoals. Vast areas dominated by polycheate worms (Potamilla neglecta and Onuphis conchylega) were encountered off the northern Massachusetts coast and southwest of Nova Scotia."

Much Information Acquired

Woods Hole staff sorted, classified, counted, and weighed 60 samples from the Albatross IV cruise. The results add much to previous faunal studies of this region. The scientists say that when all collected materials have been analyzed "there will remain only a few gaps in mapping of the benthic invertebrate communities in the offshore Gulf of Maine region."

'Albatross IV' Surveys Sea Scallops of Georges Bank & MidAtlantic

The sea scallop stocks of Georges Bank and the Middle Atlantic region were surveyed in September 1968 by Albatross IV under the supervision of Henry W. Jensen, BCF Woods Hole. On Georges Bank, most of the scallops sampled were 4 or more years old. One to 6 bushels per 10-minute tow were taken at scattered locations on eastern Georges Bank.

On Southern Georges Bank, most scallops were large, 6 years and older; there was no evidence of recruitment of younger scallops. Catches averaged less than one bushel per tow.

Near Hudson Canyon, commercial-size scallops were not very abundant and were mainly 5 years old and older. These were caught at a rate of less than one bushel per 10-minute tow. A moderate number of 3 and 4-year-old scallops were caught. This suggests sufficient recruitment of young scallops to support commercial fishing for the next 2-3 years.

Comparative tows were made using the standard 10-foot scallop dredge with 2-inch rings compared with a 30-foot calico scallop trawl lined with 1-inch mesh. When towed on smooth bottom, the 30-foot trawl caught significantly more scallops than the dredge. On rougher bottom, the trawl became loaded with shells, rocks, and other debris. These made it more difficult to handle than the dredge, and required more culling of scallops from the debris brought on deck.

'Cobb's' Pot Gear Fishes Black Cod With Encouraging Results

The John N. Cobb returned to Seattle, Wash., on Oct. 18, 1968, after an 18-day black cod (Anoplopoma fimbria) gear research cruise in offshore waters of the North Washington coast and in the Strait of Juan de Fuca. (Gear Research Cruise No. 14; Cobb Cruise 98.)

The scientific staff reported: "Initial testing of pot gear for fishing black cod provided encouraging results. Effectiveness of

pots opposed to longline gear was not fully evaluated due to low availability of fish and the presence of dogfish in each area."

In addition to the main objective of determining the feasibility of using trap-like gear (pots) for catching black cod, the staff aimed to: (1) determine the best size and depth of tunnel entrances for leading fish into the pot; (2) determine optimum soaking time; (3) determine whether cut bait in plastic screen bags would attract fish as opposed to open exposed bait; (4) and to determine suitable pot size for fishing and handling aboard fishing vessels.

Gear

The cruise began with 8 modified king crab pots (8' x 6' x 3') covered with 3-inch (stretched measure) webbing of 18-thread nylon. Each pot had 4 funnel-shaped openings extending inward about 10 inches and terminating at 6-inch rings. Ring size (tunnel) openings were increased to 8 inches in latter part of cruise. Pots were equipped with 140 fathoms of buoyline, buoys, and trailer buoys. Weight of each pot was 450 pounds. Near end of cruise 3 more pots, 4' x 4' x 3', were used to replace 4 of lost larger size pots.

Four skates of commercial black cod longline gear, 2 skates at one time, were used to determine availability of fish in an area, and as a standard gear to ascertain effectiveness of pots.

Bait

Commercially frozen bait herring was used in pots. The longline gear was generally baited with herring, although a small amount of octopus was used on several skates of gear.

Area of Operation

Two different areas off North Washington from 96 to 110 fathoms were selected as sites for experimental research. These areas had not been fished by black cod fishermen for several years but, at one time, were known to produce commercial quantities.

Method of Operation

Longline gear was usually baited with cut herring, but several times a bait-sized piece of octopus was put on every fourth hook. Pots were baited with herring cut into small pieces and inserted into plastic screen bait bags. The bags were then folded over at top, strung onto heavy gauge-wire bait hooks, and hung 2 to a pot between openings.

The fishing areas were first tested with longline gear to see whether black cod were present. When evidence appeared, baited pots were set individually and spaced $\frac{1}{4}$ mile to $\frac{1}{2}$ mile apart in one row. Flagpoles and trailer buoys were set out at each end of set as a location aid when returning to lift the gear.

Weather

Except for first 2 days, cruise weather was poor. The Cobb was turned back 8 times due to heavy seas and high winds. Swells were 18 to 20 ft. and winds 38 to 43 knots.

Gear Losses

Four large pots were lost. Two were lost to a steamship that cut off buoy lines. Buoys were recovered later. One other pot was picked up by a trawler and later returned to Cobb; one pot remains lost. One and one-half skates of longline gear became fouled on the bottom and were lost.

RESULTS

Offshore Waters

Due to bad weather, low availability of black cod, and unscheduled surveillance assignments, the pots were lifted only 4 times. The longline gear was set and hauled 12 times, mostly in search of fish. The 2 areas fished off Northern Washington were:

Area 1	48°13' N.	124°57' W.
Area 2	48°13' N. to 48°22' N.	125°11' W.

Date	Haul	Area	No. of Pots Lifted	Water Depth	Black Cod Caught	Size (cm.)	Other Fish	Total
10/8	1	1	6	98-104F	28	45-61	2	30
10/10	2	1	4	98-104F	19	45-61	1	20
10/13	3	2	6 (4 lg.- 2 sm.)	96-110F	16	65-78	2	18
10/15	4	2	6 (4 lg.- 2 sm.)	96-110F	18	70-80	4	22

Between lifts 2 and 3, bait and tunnel openings to the large pots were modified. Openings on one pot were changed from 6 to 8 inches, which resulted in taking larger-sized

black cod. Triggers (escape prevention) were added to 3 pots, and one pot was not changed (control). Pots with 6-inch openings and triggers caught less fish than control pot without triggers.

When a pot was baited with exposed bait, the bait was completely gone when pot was lifted. Conversely, the bait in pots where bait was in plastic screen bags was practically untouched at lifting time. These pots could be reset without rebaiting.

Longline Gear

Two skates of longline gear were set and hauled 12 times in areas 1 and 2. Four sets were made before any evidence of black cod was found. Results of sampling with longline gear were:

Date	Area	Depth	Bait	Soaking Time	Black Cod	Dog-fish	Other	Total
10/2	2	98-106F.	Herring	3 hrs.	0	43	0	43
10/2	2	98-100F.	"	2 "	0	42	0	42
10/3	2	101-110F.	"	2 "	0	4	3	7
10/3	1	100F.	"	2 "	5	22	0	27
10/7	1	101-105F.	Herr. & Octopus	2 "	0	35	1	36
10/10	1	98-101F.	"	1½ "	0	27	0	27
10/12	2	98-104F.	Herring	1 " 10 min.	1	31	0	32
10/13	2	101-105F.	"	1½ hrs.	0	39	0	39

Twice when octopus was used on every fourth hook, the octopus remained on hook after each hauling, but the herring was gone.

Total Catch Off Shore

Eighty-one black cod and 9 other incidental fish were taken in pots in offshore waters. Four lifts totaling 22 pot-sets were made. Sixteen longline sets produced 6 black cod and 253 dogfish. Less than 50 pounds of bait was used in the pots; the longline gear required 200 pounds.

Results in Strait of Juan de Fuca

On Oct. 15, 1968, operations were moved into the Strait of Juan de Fuca near Dungeness Spit, where both pots and longline gear were set in 70-78 fathoms. The longline gear was soaked 2 hours and caught 38 dogfish and 2 ratfish. The pots were hauled after soaking 6 hours and the catch was only one dogfish. The pots were taken aboard and reset in shallow water (15-20 fathoms). After soaking 15 hours, 3 dogfish and 1 large truecod were in the pots. Sandfleas had completely eaten the dogfish. The bait bags were completely covered with sandfleas, but they did not penetrate the plastic screen bags.

Note: For further information contact: Dayton L. Alverson, Base Director, Exploratory Fishing and Gear Research Base, 2725 Montlake Blvd. E., Seattle, Wash. 98102. Phone: 583-7729.

'Jordan' Studies Sonar Targets to Distinguish Anchovy

The David Starr Jordan cruised California waters in October 1968 to evaluate sonar targets in order to distinguish anchovy from non-anchovy schools; investigate the replication (return or repercussion) of the number of sonar targets per unit area and as affected by time of day, light, and schooling intensity; and to investigate the effects of sonar pulse length, transmission power and frequency on replication of sonar targets. (Cruise 28; Sonar Evaluation #2.)

Methods and Procedures

Tactical trawling: Usually at 4:30 a.m., at first sign of school formation, one school was chosen for trawling and ship conned onto site school occupied.

Sample trawling: At noon and midnight, samples were taken from 200 meters to surface with the midwater trawl.

Sonar evaluation: Two 3 x 6 km. (2 x 4 mi.) grid areas were established, one 3 km. (2 mi.) northeast of Arrow Point, Catalina Island, and one 3 km. (2 mi.) southwest of Ribbon Rock, Catalina Island. These sites were picked because of the density of targets and because they could be alternated if an unfavorable sea state was encountered on one side. The transducers were trained 90° to the right with a 5° down angle. Near-ship targets could be checked for surface signs of such well-known false targets as wakes of small boats, kelp, and flotsam. An XBT was taken with each grid to get some idea of thermal structure and effect it might have on sonar target count.

Results and Conclusions

Tactical trawling was impossible on the surface schools which formed most of the targets. By the time trawl had been set to

depth, the approach of the ship either had caused school to split or veer to one side of ship. Although this behavior could be watched on the sonar PPI display, the ship could not turn on short notice at this low speed with the trawl out. Several pounds of anchovy were taken in each set, but there is no way of knowing whether these fish were part of target school or not. The scientists tried approaching the school with acoustic gear turned off--with essentially no effect. They maneuvered ship so school was on port beam, and approached it with a 270° right turn--with no effect.

In summary, the scientists report the trawl is a poor sampler of small schools of rapidly swimming organisms in the surface layer, even though some individuals are caught.

Sonar Evaluation

The Jordan occupied 36 successive grids for sonar mapping in a single place. Twelve additional grids were occupied at another time during the dark phase of the moon for comparison of night schooling. Each grid consisted of two 6 km. (4 mi.) long transects. Preliminary analyses indicate that the day-night target ratio is about 4 to 1 for the 30 kHz unit.

Possible explanations for the night decrease in number of sonar targets are: (a) some targets migrate down at night; (b) some targets are masked by planktonic volume reverberation when plankters migrate upward at night; (c) the organisms making up some targets change spacing at night so they no longer reflect underwater sound; (d) some combination of these.

In the first 75-hour run, there was an average of 19.6 targets per grid from 0400-0800, 109 targets per grid from 0800 to 1600, 25.4 targets per grid from 1600 to 2000, and 31.4 targets per grid from 2000 to 0400. Lowest concentrations were at dawn and dusk, as seen on the 30 kHz sonar. For this unit, area with the most targets was 18.5 km^2 or 5.4 square nautical miles. In all, there were 1,791 discrete targets. Further analysis will be necessary to describe similar relationships for the 11 kHz unit. Preliminary analysis of target size indicates a range of school size from 15 to 300 meters diameter. The mixed layer depth was 5 to 25 meters, with intense interval wave action through the entire survey.

'Oregon' Checks Florida's Scallop Grounds

BCF's exploratory fishing vessel Oregon returned to St. Simons Island, Georgia, on Oct. 25, 1968, after 18 days of scallop explorations off Florida's east coast. (Cruise 134, Oct. 8-25.) This was the ninth in a series of industrial development cruises to keep an up-to-date check on the Cape Kennedy calico scallop (Pecten gibbus) grounds.

The cruise purpose was to determine the best areas for commercial exploitation in the time available. Four standard transects were conducted in 10- to 40-fathom depths, as in all previous cruises in this series beginning in September 1967.

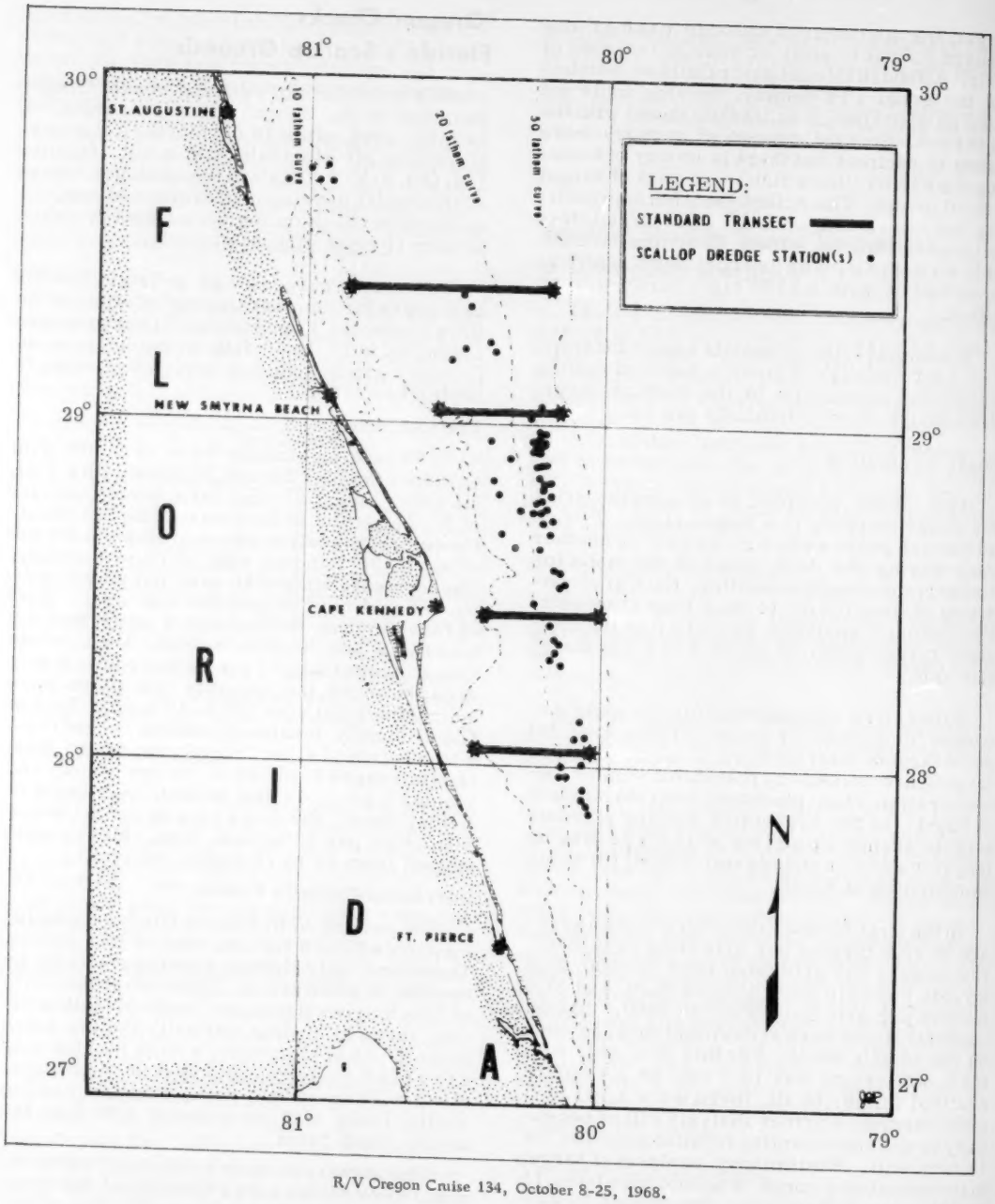
The Operation

116 dredging stations were occupied with an 8-foot tumbler dredge, finished with 2-inch diameter rings, 20 rings deep, from southeast of St. Augustine to northeast of Bethel Shoal. Commercial scallop concentrations were located in 26 fathoms east of Cape Kennedy. There, meat counts of 46 to 68 per pound surpassed previous counts for that area. East of New Smyrna, the maximum catch was 2.9 bushels per 30-minute drag. Meat counts ranged from 62 to 66 meats per pound in this area; however, the majority of scallops were subcommercial size (20 to 40 mm.). East of Cape Kennedy, maximum catches ranged from 5 to 8 bushels per 30-minute drag. Meat counts ranged from 46 to 68 per pound, and yielded 5 pounds per bushel. Northeast of Bethel Shoal, the maximum catch was 2 bushels per 30-minute drag. Meat counts ranged from 66 to 77 meats per pint.

Hurricane Curtails Cruise

The passing of Hurricane Gladys curtailed explorations for one week of this cruise. Therefore, only limited coverage could be devoted to some areas. Light coverage north of New Smyrna Beach and south of Melbourne may serve to explain partially the low catch rates there. However, a high incidence of starfish (Asterias sp.) east of Melbourne, along with numerous newly emptied scallop shells, could also be a factor affecting the area's catch rates.

Subcommercial size scallops (20 to 40 mm.) were numerous throughout the area, especially east of Cape Kennedy. There, one 30-minute drag in 22 fathoms yielded 32 bushels of seed scallops.



R/V Oregon Cruise 134, October 8-25, 1968.

'Delaware' Samples Sea Herring

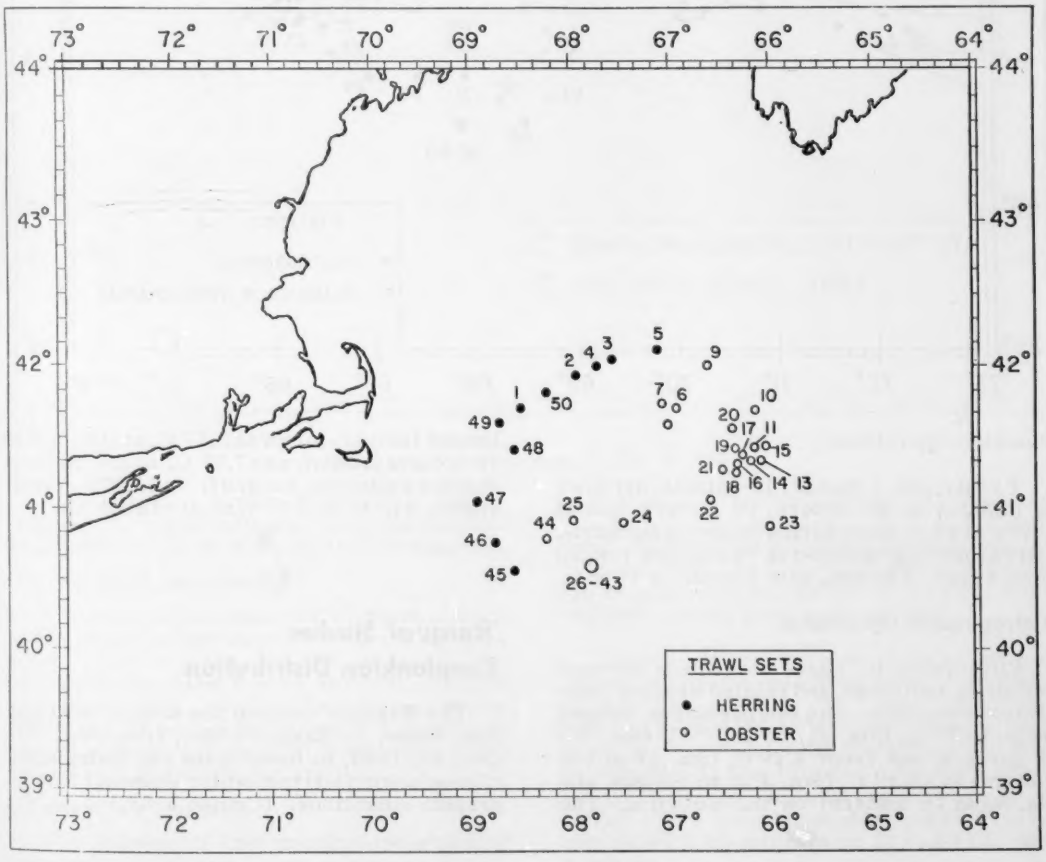
The Delaware cruised the general area of Georges Bank and the continental shelf from Corsair to Hydrographer Canyon in fine weather from Oct. 9-18, 1968. (Cruise 68-10 & Part II of 68-9.) Her purposes were to: (1) sample populations of sea herring and obtain related environmental data, (2) make plankton tows for larval herring, (3) obtain hearts from designated herring samples, and hearts and blood from designated lobster samples, and (4) tag and release lobsters.

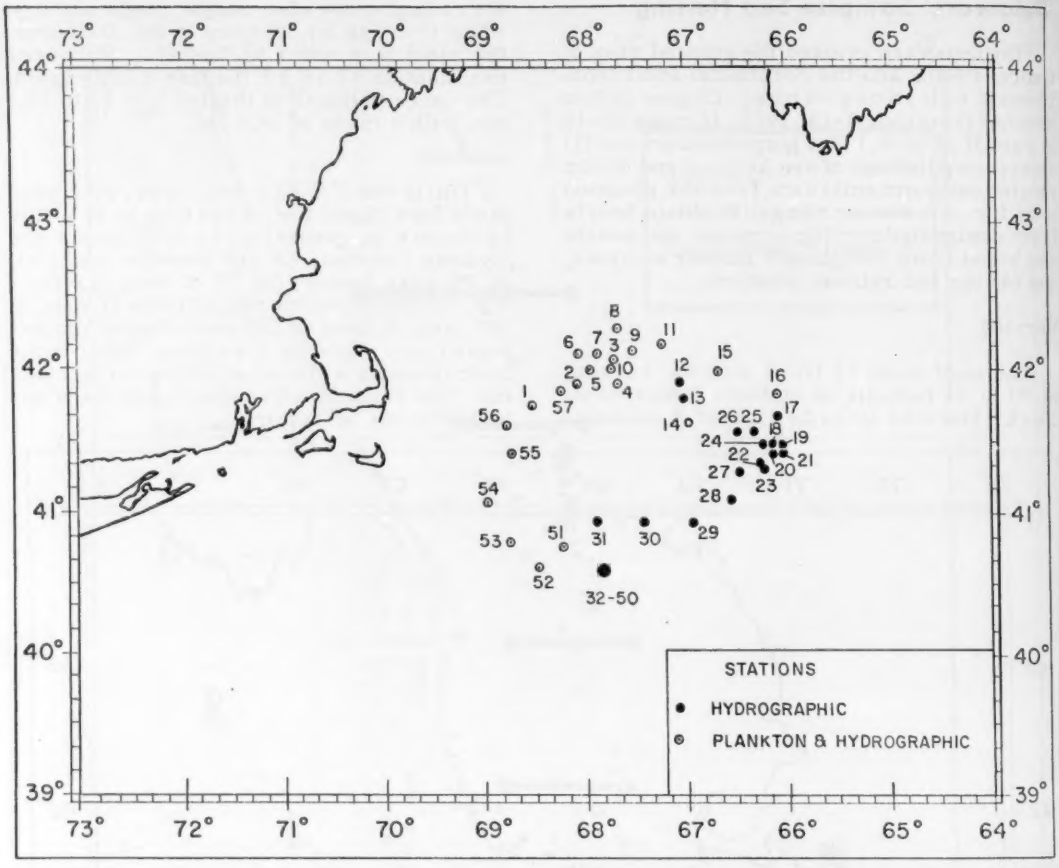
Herring

The staff made 14 trawl sets for herring in 30 to 86 fathoms at stations indicated on chart. The sets yielded about 2 bushels. Herring were also caught (night and day) while trawling for lobsters in the shelf area; the yield was about $5\frac{1}{2}$ bushels. Shipboard examination showed the fish mostly spent. The range in length of the fish was 22 to 35.5 cm. with a mean of 30.6 cm.

Lobster

Thirty-six 1- and 2-hour trawl sets were made (see chart) for lobsters in 24 to 100 fathoms in general area of Corsair and Lydonia Canyons. Of 315 lobsters caught, 61.9% were females (37.7% of them berried). The carapace lengths ranged from 71 mm. to 199 mm. A total of 223 were tagged and released near Lydonia Canyon. Sixty-three lobster hearts were collected for racial studies. The remaining live specimens were returned to the laboratory.





Plankton Operations

Twenty-one 1-meter, 15-minute net tows (5 minutes at 20 meters, 10 meters, and at surface) were made during cruise (see chart). Larval herring obtained at 15 stations ranged from 6 mm. to 20 mm. with a mean of 11 mm.

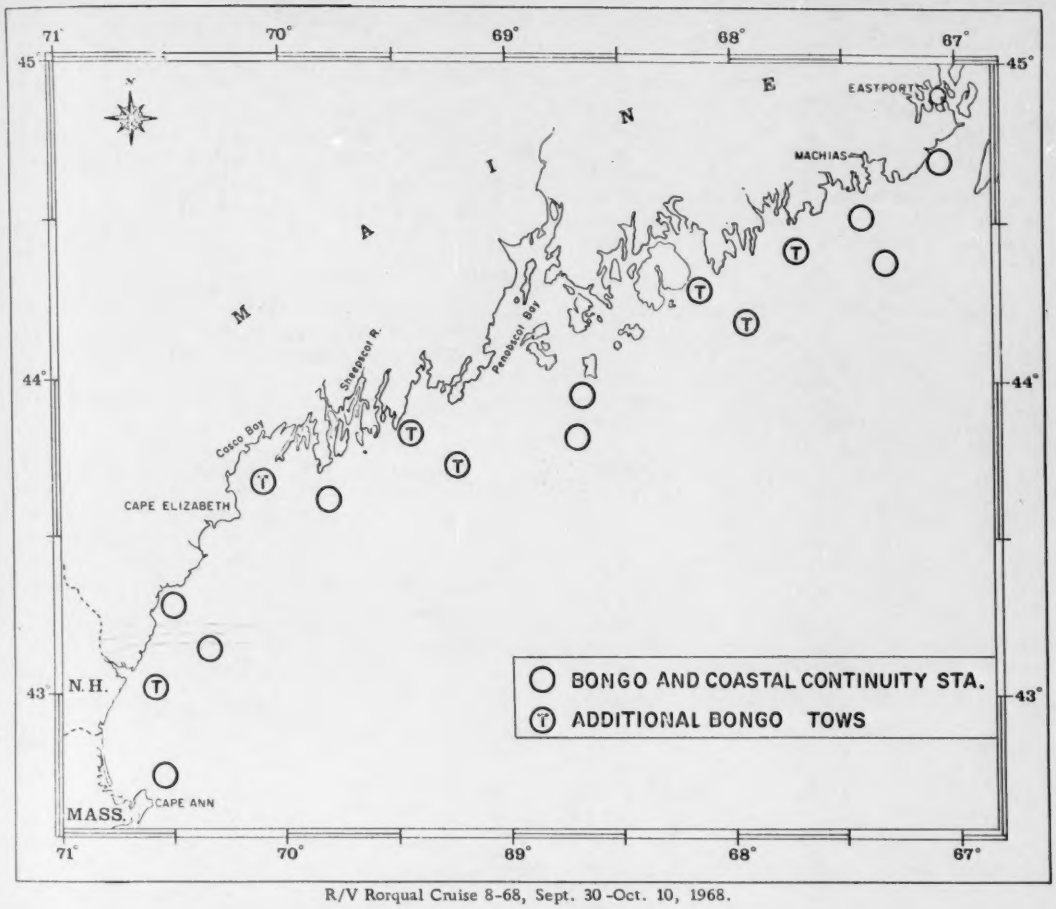
Hydrographic Operations

Fifty-seven BT casts were made, surface salinities collected, and related weather conditions recorded. The temperatures ranged from 13.6° C. (Sta. 31) to 20.9° C. (Sta. 50) at surface, and from 4.1° C. (Sta. 56 at 100 meters) to 15.1° C. (Sta. 4 at 40 meters and Sta. 53 at 75 meters) on the bottom. The lowest temperature was 3.1° C. at station 6 at 75 meters (bottom was 7.0° C. at 225 meters). Surface salinities ranged from 32.273 o/oo at station #55 to 35.838 o/oo at station 50.

'Rorqual' Studies

Zooplankton Distribution

The Rorqual cruised the waters off Cape Ann, Mass., to Eastport, Me., from Sept. 30-Oct. 10, 1968, to investigate the distribution of zooplankton and to monitor seasonal hydrographic conditions. (Cruise 8-68.)



R/V Rorqual Cruise 8-68, Sept. 30-Oct. 10, 1968.

A modified Brown-McGowan sampler (Bongo) was towed obliquely from the surface to 20 meters at 19 stations for 30 minutes.

Hydrographic Observations

A Nansen bottle cast was made to collect water samples for salinity determination at 0, 10, 20, 30 meters, and just above bottom. Bathythermographs traced vertical changes in temperature. Water transparency was measured at each hydrographic (continuity) station. Five surface drift bottles were released at 6 hydrographic stations.

Preliminary Findings

The volume of the zooplankton standing crop decreased from a summer mean of 5.31 cc/100m^3 of water strained by the sampling gear to 4.17 cc/100m^3 during this cruise. The greatest decrease was in the eastern area. In previous autumns, the volumes decreased from west to east, but this autumn (as in past summer) the volumes in the western and central area were similar.

Larval herring were obtained in the central and eastern areas; they were most abundant in the eastern area. Large deposits of herring eggs were reported in September from the inshore vicinities of Cutler and West Quoddy Head. Special tows were taken there, but no large quantities of larvae were obtained. This is not unusual because the larvae are known to migrate or disperse after hatching.

'Miller Freeman' Proves Fine Research Ship

The new BCF research vessel Miller Freeman departed Seattle, Wash., in mid-February on cruise 68-02 (Feb. 12-Mar. 20, 1968). Primary objectives were to: monitor spawning of Pacific hake in California waters; determine the age, size, and sex composition of these hake stocks; and sample for changes in spawning habits of food and forage fish off the Washington coast.

Eggs and larvae were collected at stations along the standard Washington transect (fig. 2) at the beginning and end of the cruise, at 20 stations between San Francisco and Point Conception, Calif., and at 13 stations off southern California and northern Baja California. During the remainder of the cruise, the Miller Freeman conducted acoustic fish scouting and midwater trawling for adult hake.

In attempts to locate schools of hake off southern California, the Miller Freeman operated in company with the Exploratory Fishing and Gear Research vessel "John N. Cobb" and the chartered vessel "Baron."

Sampling With Net & Trawl

Eggs and larvae were sampled with a 1-meter plankton net and adult hake with a $\frac{2}{3}$-scale Universal trawl (with $1\frac{4}{4}$-inch mesh and $\frac{1}{2}$-inch cod end liner). The trawling system also included pelagic hydrofoil-type otter doors, electric conductor towing cables, depth telemetry, echo-sounder, winches, stern ramp, and hydraulic gantry.

Quantities of larvae of various species were taken off Washington, but eggs and larvae of hake were abundant only off southern California. Unfortunately, catches of adult hake were too small to permit analysis of the population features of the spawning stock.

The satisfactory performance of the newly commissioned Miller Freeman and its unique midwater stern trawling system were rewarding. The experience gained by the crew and laboratory scientists led to the correction of the observed shortcomings in the trawling equipment and procedures.

Fig. 1 - The Miller Freeman.

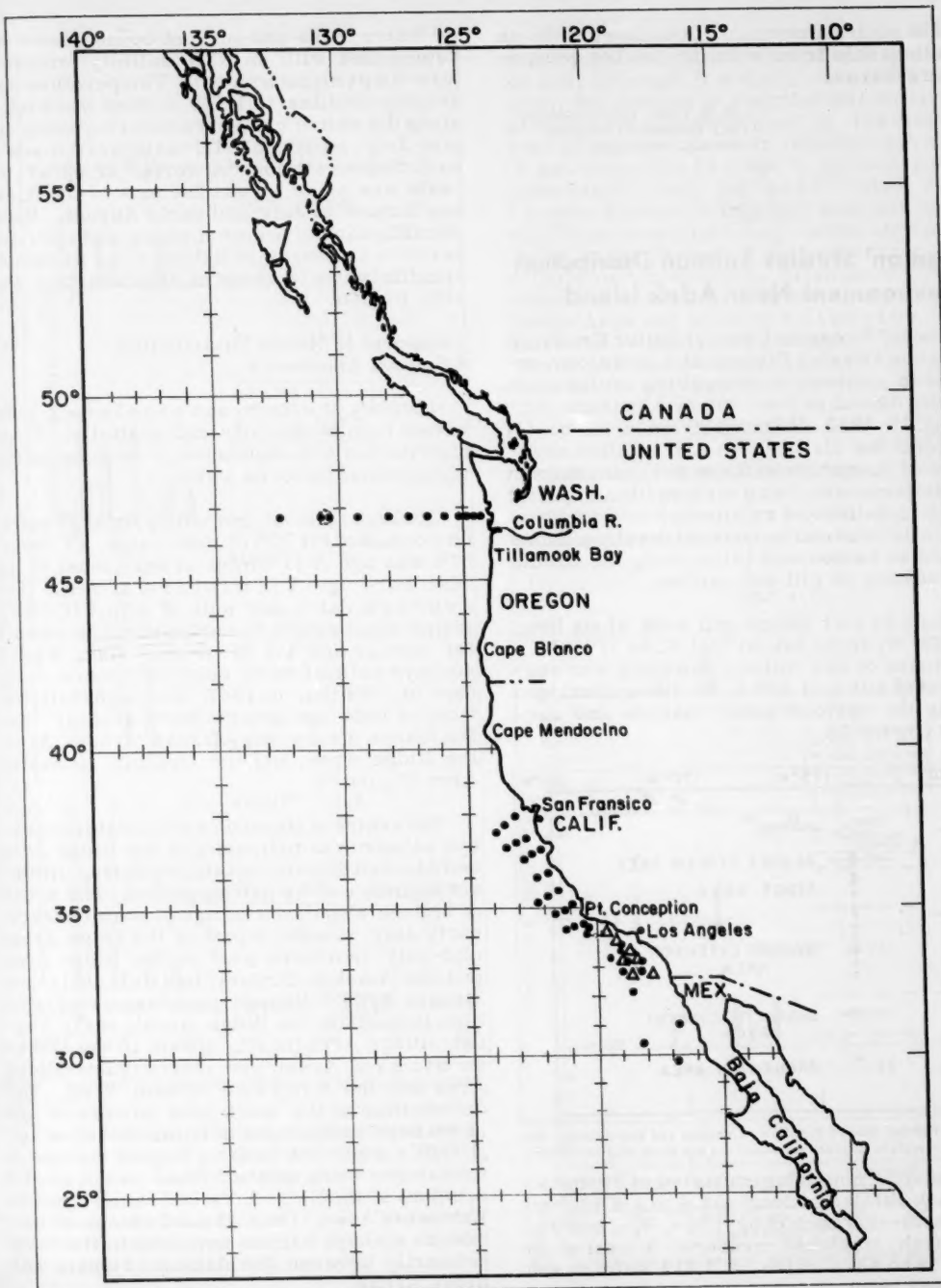


Fig. 2 - Egg and larval sampling stations (•), and trawling areas (Δ) of the Miller Freeman hake spawning Cruise 68-02.

The Miller Freeman promises to be an excellent ship from which to conduct groundfish research.

--N. B. Parks, Fishery Biologist
BCF Biological Laboratory
Seattle, Washington

'Freeman' Studies Salmon Distribution & Environment Near Adak Island

The BCF research vessel Miller Freeman, Seattle (Wash.) Biological Laboratory, engaged in a fishery-oceanography cruise south of Adak Island in the central Aleutians, July 1-Aug. 15, 1968. Her objectives were to: (1) examine the distribution and relative abundance of immature sockeye and chum salmon in relation to environmental features, (2) compare indices of relative abundance of salmon from simultaneous catches by gill nets and purse seines, and (3) to study the effects of predation on gill-net catches.

The vessel fished gill nets along long. 176°22' W. from lat. 51°34' N. to 46°30' N., a distance of 320 miles. Sampling was concentrated north of 49° N.; it was apportioned among the various water masses and currents (figure 1).

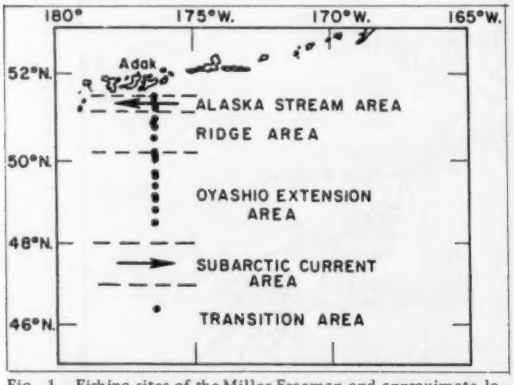


Fig. 1 - Fishing sites of the Miller Freeman and approximate location of surface currents and water masses south of Adak Island.

The basic net string consisted of 24 shackles (each 50 fathoms long--91.4 m.) of braided nylon nets--six each of $5\frac{1}{4}$-, $3\frac{1}{4}$-, $4\frac{1}{2}$-, and $2\frac{1}{2}$-inch mesh, stretched measure. A total of 39 sets yielded a catch of 3,413 salmon and steelhead trout.

Water mass and current boundaries were determined with an STD (salinity-temperature-depth) instrument. Temperature and salinity profiles to 1,500 meters were taken along the entire cruise track during early and mid-July; additional STD casts were made at each fishing station. A series of shallow casts was made across the axis of the Alaskan Stream in July and early August. Rapid identification of water masses and currents permitted changes in fishing sites to sample specific water masses of the Subarctic Pacific Region.

Temporal & Spatial Distribution & Salmon Abundance

Catches of salmon and steelhead trout varied both temporally and spatially. Their distribution and abundance in relation to environmental features were:

Sockeye salmon: Immature sockeye salmon accounted for 72% of total catch. Of these, 87% was age .1 (1 winter at sea); most of the rest were age .2 (2 winters at sea). The average catch per unit of effort (CPUE), giving equal weight to each mesh size was 8.3 for age .1, and 1.1 for older fish. Age .1 sockeye salmon were relatively more abundant in 1968 than in 1967. Although distributions of both age groups were similar, they fluctuated among the Alaskan Stream Area, the Ridge Area, and the Oyashio Extension Area (figure 2).

The center of abundance of immature sockeye salmon was primarily in the Ridge Area and Alaskan Stream, but shifted during different segments of the netting period. The areas of highest abundance of age .1 salmon were: early July--southern part of the Ridge Area; mid-July--northern part of the Ridge Area and the Alaskan Stream; late July--Alaskan Stream Area (although abundance was also high throughout the Ridge Area); early August--Ridge Area (nearly absent in the Alaskan Stream Area); and mid-August--Ridge Area and the Alaskan Stream Area. The distribution of the much less numerous age .2 sockeye salmon was similar to that of age .1 fish, except that in early August the age .2 immatures were most abundant in the southern part of the Ridge Area and in the Oyashio Extension Area. Thus, the abundance of immature sockeye salmon appeared to fluctuate primarily between the Alaskan Stream and Ridge Areas.

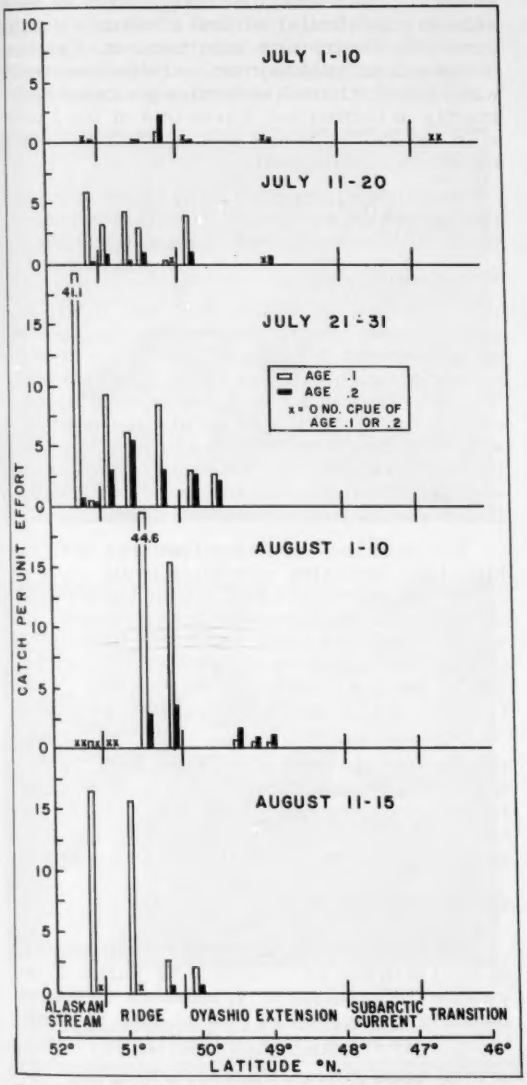


Fig. 2 - Relative abundance of immature sockeye salmon, summer 1968.

Chum salmon: Immature chum salmon accounted for 16% of the total catch. Nearly 60% was age .1 and the remainder age .2 or older. Abundance of immature chum salmon was relatively less than in 1967. The average CPUE in 1968 was only 1.1 for age .1, and 0.7 for age .2 immatures.

The distribution of immature chum salmon was roughly similar to that of sockeye salmon and, although it usually covered a wider area, differences in distribution between age groups were greater (figure 3). The distribution of age .1 fish was: (distribution of age .2 and older fish is given in parentheses when significantly different) early July--Oyashio Extension Area and southern part of the Ridge Area; mid-July--most abundant in the Alaskan Stream Area and scarce in the other water masses (age .2 fish were virtually absent from Alaskan Stream and scarce in Ridge Area and Oyashio Extension Area); late July--moderately abundant in Alaskan Stream Area, relatively scarce in Ridge Area, and absent in Oyashio Extension Area (age .2 fish were scarce in Alaskan Stream and most abundant in northern part of Oyashio Extension Area, near lat. 49°30' N.); early August--scarce in all areas (age .2 fish were still concentrated in Oyashio Extension Area); mid-August--abundant in Alaskan Stream Area and scarce in other areas.

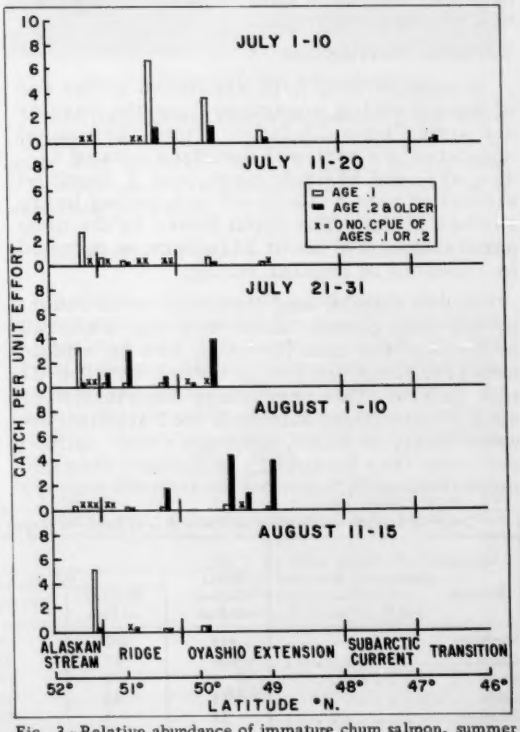


Fig. 3 - Relative abundance of immature chum salmon, summer 1968.

Immature chum salmon then, appeared to shift in abundance among Alaskan Stream, Ridge, and Oyashio Extension Areas.

Other species: Coho salmon made up about 10% of total catch; a few pink and chinook salmon and steelhead trout were also taken. Most salmon were caught in Ridge and Oyashio Extension Areas in late July and early August. Only 13 steelhead trout were captured, mostly from Oyashio Extension Area south of lat. 50° N.

Significance of Catches

The catches of immature sockeye and chum salmon suggested that abundance of the immature fish was not constant in any area--but changed as successive fluctuating waves passed from one water mass to another. These results also raise the possibility that these species may migrate from south to north before turning west in the Alaskan Stream and Ridge Areas.

Data are inadequate to infer migration patterns for coho, pink or chinook salmon, or for steelhead trout.

Vertical Distribution

A panel of deep nets was fished at one end of the net string, separated from the regular net string by a 15-fathom line. The panel consisted of a string of 4 surface nets of $5\frac{1}{4}$-, $3\frac{1}{4}$-, $4\frac{1}{2}$-, and $2\frac{1}{2}$-inch mesh, and 2 identical strings of nets attached in a series below surface string. The depth fished by the deep panel extended to about 23 meters as opposed to 7 meters of regular string.

Of 647 salmon and steelhead trout caught in the deep panels, about 62% was captured in the surface nets (0-7 m.), 23% in middle nets (7-15 m.), and 15% in bottom nets (15-23 m.), table. The percentage distribution of sockeye and chum salmon in the 3 depth strata were fairly similar, although chum salmon occurred less frequently in surface nets and more frequently in bottom net than did sockeye salmon. The vertical distribution of coho salmon was similar to that of chum salmon; over 25% of catch was in bottom net. Catches of chinook and pink salmon and steelhead trout were small; chinook salmon were caught primarily in bottom net, whereas 4 of the 7 pink salmon, and 6 of the 7 steelhead trout, were caught in surface net.

Deep nets will be used in the future to examine further the vertical distribution of salmon in relation to water masses and currents.

Predation Studies

Although it is known that sea lions, fur seals, birds, and possibly sharks feed on salmon caught in gill nets, the effect of predation on catch rate has not been determined. To investigate this relation, dead salmon were attached to the gill net at time nets were set. The fish were tied to the cork and lead lines. Normally, 20 fish were attached per night and records kept of number of "decoy" fish recovered when nets were lifted.

The total loss of decoy fish was 67%; the high loss indicates predation could have an important effect on catch rate. Loss tended to decline as distance offshore increased. Inshore, where sea lions, seals, and birds were more numerous, loss of decoys often reached 100%. Beyond 100 miles, loss was still great, from 15 to 57%, and averaged nearly 40%.

The loss of decoy fish was not directly proportional to size of salmon catch. In 4 of the 5 sets in which total catch was less than five fish, 100% of decoy fish was lost; in 8 of the 9 sets in which catch exceeded 100 fish, an average of over 70% of the decoys was lost.

Comparative Fishing

The Miller Freeman made 10 gill-net sets in the immediate vicinity of purse-seine vessel 'Commander' (Fisheries Research Institute, University of Washington, Seattle)1/ to compare catch rates of the 2 types of gear.

Catch of Salmon and Steelhead Trout in Gill Nets, by Depth of Net, During Studies of Vertical Distribution in Spring 1968

Species	Total Number of Fish	Depth of Gill Net					
		0-7 m		7-15 m		15-23 m	
		Number of Fish	Percentage	Number of Fish	Percentage	Number of Fish	Percentage
Sockeye	444	290	65.3	111	25.0	43	9.7
Chum	105	53	50.5	26	24.8	26	24.7
Pink	7	4	57.1	1	14.3	2	28.6
Coho	73	43	58.9	11	15.1	19	26.0
Chinook	11	3	27.3	1	9.1	7	63.6
Steelhead	7	6	85.7	0	0.0	1	14.3
Total	647	399	61.7	150	23.1	98	15.2

1/Under contract to BCF.

Because both types had been used to index salmon abundance in Adak Island Area, it was necessary to determine extent to which these different methods of sampling agreed in providing indices of salmon and trout populations.

Fig. 4 - Setting nets from the Miller Freeman.

Fig. 5 - Hauling gill nets aboard Miller Freeman.

Comparison of purse seine and gill-net catches in previous years indicated considerable discrepancies in catch. Indeed, it showed little correlation in abundance or species composition. Comparisons in 1968 also indicated similarities and inconsistencies previously observed. Large gill-net catches were correlated with large purse-seine catches; large purse seine catches, however, did not necessarily accompany large gill-net catches.

Fig. 6 - Taking STD from Miller Freeman.

Comparisons of these 2 types of gear were difficult because of inherent differences in gear and methods of fishing. (Factors that influence such comparisons are subject of a separate paper[2].)

A Successful Cruise

The Miller Freeman's 1968 summer cruise successfully completed the major objectives. It obtained new information on distribution of salmon in relation to environmental features. This information was presented at the 15th Annual Meeting of the International North Pacific Fisheries Commission (Seattle, Wash.) in November 1968.

2/Craddock, Donovan R. 1968. Comparisons of gill net and purse seine catches of salmon in North Pacific Ocean. Unpublished MS, Biological Laboratory, BCF, Seattle, Wash.

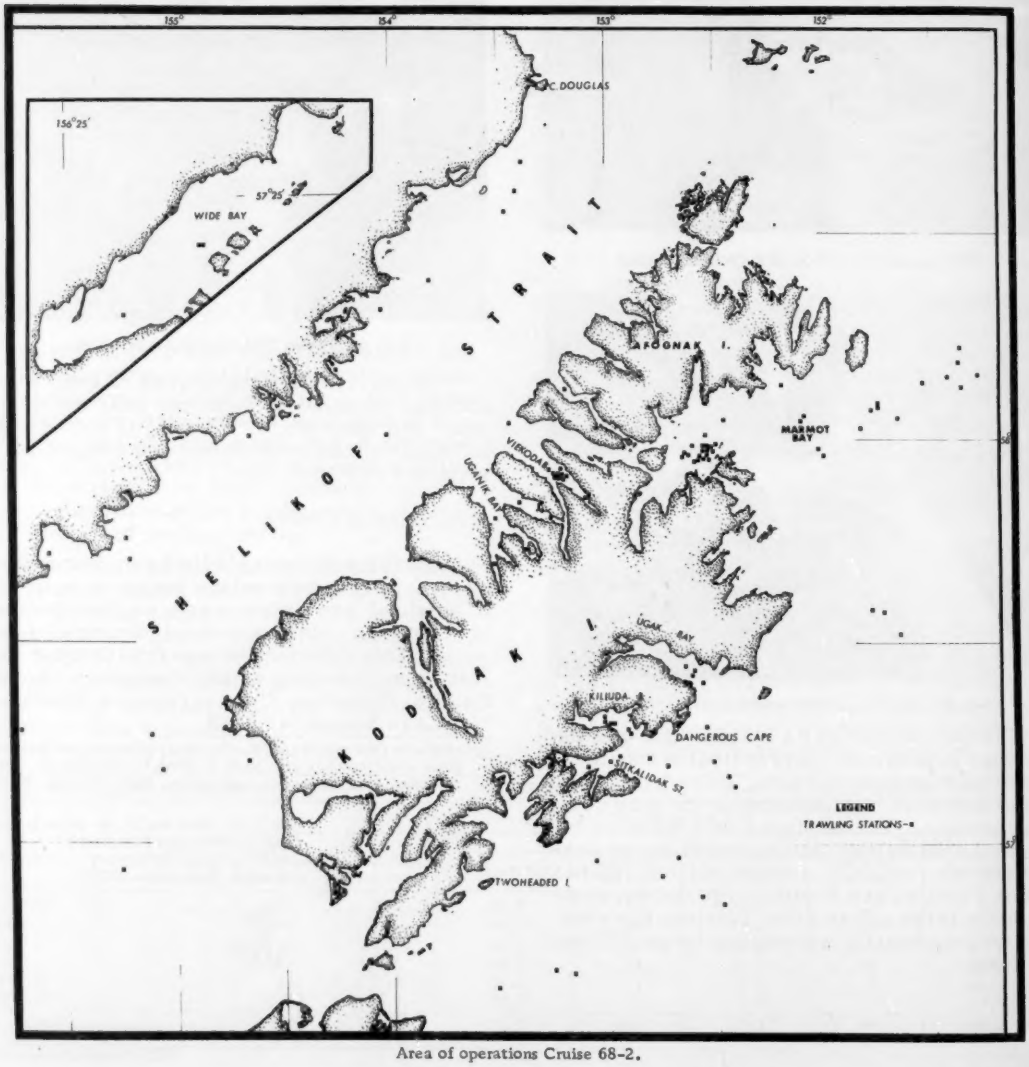
--By J. R. Dunn and D. F. Sutherland
Fishery Biologists (Research)
BCF Biological Laboratory
Seattle, Washington 98102

'Manning' Explores for Shrimp in Kodiak Island Area

BCF's John R. Manning returned to Juneau, Alaska, on Oct. 2, 1968, after a 13-week combination exploratory fishing and gear research survey for shrimp in the Kodiak Island area (Cruise 68-2).

The area included selected bays along the eastern and western shores of Kodiak Island, offshore waters along the eastern shore of Kodiak Island, Shelikof Strait, and bays along the Alaska Peninsula between Cape Douglas and Wide Bay.

Cruise objectives were to (1) test-fish a BCF-developed 2-bag shrimp trawl on commercial fishing grounds to determine degree of separation of groundfish and debris from shrimp; (2) gain information on distribution and size of commercially interesting shrimp species: pink (Pandalus borealis), coonstripe (P. hypsinotus), humpy (P. goniurus), and sidestripe (Pandalopsis dispar); (3) make



Area of operations Cruise 68-2.

exploratory tows for shrimp in areas preselected by local Kodiak fishermen to determine if commercial size catches could be harvested; (4) conduct a preliminary bulk-shrimp pumping trial to see if shrimp could be pumped from a test tank, and (5) log sightings of foreign fishing vessels for Branch of Enforcement and Surveillance.

During survey, 102 drags were made. Trawls utilized were (1) an 85-foot Universal shrimp trawl--23 drags, (2) a 66-foot Kodiak shrimp trawl--59 drags, (3) a 70-foot two-bag shrimp trawl--16 drags, and (4) a 40-foot Gulf shrimp trawl--4 drags.

The largest catch occurred 35 miles east of Two Headed Island, during tow 69, over a bottom depth of 81 to 90 fathoms. There, 26,400 pounds of Alaska pollock (Theragra chalcogrammus) were collected in a haul of assorted groundfish totaling 28,800 pounds.

Exploratory Fishing

Shrimp explorations were conducted in inshore and offshore waters of Kodiak Island and Shelikof Straits (Fig. 1) using a standard commercial 66-foot shrimp trawl. Fifty-seven stations were fished throughout the survey area. Catches ranged from 0 to 13,500 pounds of shrimp per hour fished, and averaged 1,343 pounds per hour for all drags.

Pounds of Shrimp	No. of Drags
0 - 499	31
500 - 999	6
1,000 - 1,999	7
2,000 - 2,999	6
3,000 - 2,999	3
over 4,000	7

Drags that produced over 1,000 pounds per hour were made in Marmot Bay, Marmot Gully, 13 miles ESE Geese Island, Wide Bay, Raspberry Strait, south and north Arms Uganik Bay, Uganik Bay, and Uganik Passage, Kuliak Bay, Kinak Bay, 5 and 7 miles east of Kiukpalik Island, and Kukak Bay.

Universal Shrimp Trawl

Preliminary tests were made with an 85-foot universal shrimp trawl designed by BCF's Exploratory Fishing & Gear Research Base in Seattle, Wash. The universal trawl is designed to be fished either off-bottom at intermediate depths, or on bottom.

Initial trials were conducted in Viekoda Bay during daylight. During all dragging, a light off-bottom trace of shrimp was showing on echo sounder. Four drags were made with the trawl doors from 3-7 fathoms above bottom. In all cases, the trawl's footrope came into contact with bottom as shown by composition of catch. Four drags also were made at mid-depths: the trawl doors were 7-33 fathoms above bottom. The on-bottom catches of shrimp ranged from 301 to 2,160 pounds and averaged 1,173.5 pounds per hour fished; the mid-depth catches ranged from 85-858 pounds and averaged 430.7 pounds per hour fished.

One very noticeable difference between on-bottom and mid-depth catches was species composition. The former consisted of 67.12% pink, 26.27% humpy, 5.55% sidestripe, and 1.05% coonstripe shrimp; the mid-depth catches consisted of 80.78% humpy, 18.74% pink, and .48% sidestripe. No coonstripe shrimp were taken at mid-depths. The average catch per hour of humpy shrimp was about same for on-bottom (307.8 pounds per hour) and mid-depth drags (348 pounds per hour); pink and sidestripe shrimp increased in on-bottom drags. The on-bottom and mid-depth experiments with universal trawl were continued in Marmot Bay. Three 1-hour drags were made in Viekoda Bay procedure. The on-bottom drag produced 666 pounds of shrimp; the mid-depth trials (3-9 fathoms off-bottom) caught 200 pounds and (28-53 fathoms off-bottom) 33 pounds.

Two-Bag Trawl Tests

Sixteen test tows were made with the 2-bag trawl. Gear testing was conducted in areas routinely fished by commercial trawlers: Marmot Bay (1), Uganik Bay (4), Kiliuda Bay (4), Sitkalidak Strait (2), and off Dangerous Cape (2). Three more tows were made in Viekoda Bay on western side of Kodiak Island. Sampling depth varied between 32 and 85 fathoms in Viekoda Bay, and between 41 and 74 fathoms along eastern shore of Kodiak Island. Results from 15 test tows showed 83.33% (17,078 pounds) of shrimp collected in shrimp bag, while 16.66% (3,415.5 pounds) was collected in fish bag. The percentage composition of groundfish was 12.46% (1,276 pounds) in shrimp bag, and 87.53% (8,962.4 pounds) in fish bag.

Shrimp-Pumping Trials

A capsule pump like those in South American anchovetta fishery was used in shrimp-pumping trials aboard Manning. The submersible pump housing was lowered into a

test tank filled with seawater and shrimp. Results of trials were negative. The shrimp, unlike fish, did not flow toward and into pumping stream. A vertical mass of shrimp remained surrounding the housing after water had been pumped from test tank. An adapter designed to increase the pump's effective drawing range will be installed during planned tests aboard a commercial trawler in the future.

BCF Scientist Aids Coast Guard's Glacier Study

Roger Theroux of the Woods Hole Biological Laboratory took part in a Coast Guard survey in summer 1968 of west Greenland waters aboard the USCGS "Eastwind". The survey was the first in a series of annual expeditions by the International Ice Patrol.

The project's objectives are "to determine the number of icebergs calved from the glaciers, and to survey the glacier fronts and environmental conditions affecting discharge, including the hydrography, bottom sediments and benthic organisms."

Theroux collected and studied benthic animals and helped collect bottom sediments.

The Operation

The field party joined the Eastwind at Thule, Greenland, and moved south along coast to Sondre Strømfjord. "Samples and observations for hydrographic and benthic studies were collected most frequently in fjords servicing berg-producing glaciers." Personnel went by helicopter to survey and mark glaciers.

Fast-Sinking Purse Seine Is Shaping Up

The July 1968 Commercial Fisheries Review reported the development of a fast-sinking purse seine that will provide tuna fishermen with more efficient gear.

In designing the "hybrid" net, M. Ben-Yami, visiting investigator from the Israel Department of Fisheries, worked with Roger Green, Fishery Biologist at BCF's Fishery-Oceanography Center at La Jolla, Calif. They attempted to combine "the fast-sinking qualities of the North Atlantic purse seine with the strength, deep-fishing, and ease of handling of the California tuna seine." Model tests of this net were very encouraging. So a full-scale net, 460 fathoms by 55 fathoms, was built in spring 1968 in a San Pedro net yard. It was field tested successfully with the help of Jerry Jurkovich, gear technician from the BCF Exploratory Fishing and Gear Research Base in Seattle, Wash.

Sea Trials

The initial sea trials showed that the new net sank about 70% deeper and at a significantly faster rate than conventional 7-strip tuna purse seines. The hybrid purse seine also maintained its initial diameter well into pursing. This was in contrast to conventional nets, whose tightly hung webbing during sinking causes the floats to bunch and the net's diameter to shrink; this results in crowding fish by a diminishing circle of webbing before escape routes are closed. "The deep, square cut ends (gavels) of the net, with their long, separately pursing, breast lines, showed no tendency to foul or roll in the purse line and were handled without loss of time. Also, because the gavels hang nearly vertically beneath the boat, the new net offered a very reduced escape route for fish."

A Minor Problem

Only one minor problem has been encountered: the net is somewhat more difficult to stack and takes longer than others. But with practice and modified handling techniques, this time may be shortened. The researchers expect that sinking rates and depths will increase as the net is "broken in" during fishing by removal of excess tar and increasing flexibility.

ARTICLES

The famed explorer and oceanographer tells of the sea's riches and his approaching Odyssey aboard the 'Ben Franklin.'

THE PROMISE OF THE UNDERWATER WORLD

By Jacques Piccard

The underwater world holds promise and importance for all of mankind. In my estimation, it is as vital to the Australian sheep rancher or European housewife as it is to the Gloucester fisherman or Louisiana wildcatter. The sea affects all our lives in a variety of ways, and better understanding of the seas and their mechanics can only make the lot of all mankind easier, more productive, and more satisfying.

The theme of my remarks, then, is to be the need, by whatever means you gentlemen of the Congress ultimately decide upon, for speeding the orderly exploitation and development of the riches of the Continental Shelf and the oceans, which, rather than separating the United States from its Asian, European, or African neighbors, rather provides a ready and convenient link with them.

The vastness of the subject almost makes it impossible to know where to begin. Allow me to start with some of the more familiar uses and products of the oceans and proceed to some of the more exotic, esoteric fields where today we are just piercing the surface, so to speak.

For as long as man has lived on the shores of the oceans, rivers and lakes, he has been nourished by the fish he has been able to lure, trap, snare, spear, or net from the beach or a boat. It is amazing to note that the methods of catching fish are practically the same today as they were in the earliest dawn of mankind, and certainly not much more sophisticated than those in the days 2,000 years ago when men drew their precious food from the Sea of Galilee in straining nets and bobbing boats.

The processing and marketing of seafood have developed along technological lines, but we are still in the Dark Ages when considering the search for fish, knowledge of their habits, spawning grounds and their nutritional value. Recent developments have been made in the production of fish protein concentrate, thanks to great encouragement and financial support by the U.S. Government, and a great deal more must be done to produce and merchandise this dietary supplement for Americans and, perhaps more importantly, for those millions of undernourished people whose protein supply is inadequate.

Better organized fishing methods will not only increase the catches and yields of the commercial fisherman, but will also help guard against the annihilation and disappearance of certain species of food fish--a sad fact which has already seen the reduction to dangerous limits in some areas of halibut, salmon, lobster, and shrimp.

Finally, it should be mentioned that while every maritime nation of the world has shown substantial increases in fish production and consumption, the United States has been at a virtual standstill, with fish imports rising to the point where Americans now eat more imported fish than that caught and processed domestically. Surely this is an area which deserves more attention and support.

Linked to the food-from-the-sea activity is the problem of pollution of the sea. This is a thorny problem, but because it is man-made, it admits of a solution. We have already seen great quantities of shellfish from large areas declared unfit for human consumption because of polluted waters--in the Raritan Bay area of New Jersey, for example.

We must guard against increasing destruction of the species and upsetment of the marine environment too by dumping, radioactive

This article is nearly all of Dr. Piccard's testimony before a subcommittee of the House Committee on the Judiciary, July 24, 1968.

waste discharging, drainage from industrial plants and even the introduction of the heated water used for cooling powerplants to normally cool fish feeding grounds. A problem such as this which transcends State borders seems to call for the attention of, if not the regulation by the Federal Government.

My father once said that exploration is the sport of the scientist, and it is in exploration that much of oceanographic activity is found today.

Gentlemen, we are standing not at a single threshold, but before a long corridor marked by a series of doors. Behind each is a new and exciting field of opportunity awaiting the imaginative, the daring, the enterprising men who are blessed with both vision and the means to exploit these riches.

Besides food, the oceans contain, or more precisely, separate man from rich mineral deposits. One authority has calculated that the seas contain 30,000 trillion tons of chlorine--that is 30 followed by 15 zeros--2,000 trillion tons of magnesium, and similarly staggering quantities of sodium, sulphur, potassium, bromide, and carbon, and so on. The interesting point is that these minerals are not found only in minute quantities in the water itself. Off the California coast, phosphorous nodules resembling large pebbles are scattered around the seafloor at depths from 200 to 8,000 feet at least. Best known are the manganese deposits, confirmed to exist in the Atlantic, Pacific, and Indian Oceans.

While sufficient quantities of these various elements are obtainable on land, their expoitation from the seabed will receive low priority. When poorer strata are mined on land, raising production costs there, greater attention can be expected for offshore mining development. Such was the case in the petroleum industry, which is by far the leading developer of offshore resources.

Today some 70 countries are involved in the quest for oil and gas beneath the Continental Shelf. Twenty countries are producing these products, by recent estimate.

Like every general statistic about the seas the figures regarding petroleum production and reserves defy the imagination. About one-fifth of the world's total known oil reserves of 425 billion barrels is found offshore. Currently about $5\frac{1}{2}$ million barrels are produced each day from wells sunk offshore. This is about 16 percent of the world total. In another 10 years perhaps 33 percent will come from offshore--all this to meet a demand which is increasing at a rate of 7 percent a year. No need to belabor the importance of offshore oil and gas production. It is, after all, the very raison d'etre of the legislation you are considering.

We must also acknowledge, too, that the water-starved areas of the globe see in the salty surface of the oceans, their first source of potable water, as desalinization techniques grow and hold out promise of abundant fresh water everywhere in the world. If we could theoretically separate all the minerals from all the water in the oceans, we would have, on one hand, enough salts to fill a freight train stretching back and forth between the earth and the sun 300,000 times and, on the other, about 1,500,000 trillion tons of fresh water. I apologize for having to resort to these big numbers, but I know you gentlemen want to know the facts.

We are only beginning to fully appreciate the preeminent role of the oceans in the origin and influence of weather. If man is to accurately predict the weather, to guard against destructive waves, prepare for hurricanes and typhoons, and some day exercise a degree of control over the elements, he must learn a great deal more of the dynamics that go on where sea meets sky, and the massive movements of ocean waters from one region to another.

While these remarks have dealt with, let us say, peaceful or materially productive uses of the seas, we cannot overlook the strategic importance of the undersea world in defensive and possibly offensive warfare. Greater knowledge of the terrain, not only along the Continental Shelves, but in mid-ocean as well, is needed to assure the safe transit of military submarines. And we must understand the acoustic phenomenon better if effective defense measures are to be prepared.

The very immensity of the seas, which, as you know, cover about 70 percent of the earth's surface, makes a concise and specific summary of ocean-related activities difficult, if not impossible. Likewise, the fledgling efforts of governments and private industry are as diverse as the problems and challenges themselves.

Many, many American industrial firms have been attracted beyond the water's edge, so to speak. And they have invested sizable sums of their own money in the oceanography market. I would like to take just a minute to describe one of these programs, the oceanographic activities in which I am presently engaged with the Grumman Aircraft Engineering Corp. in Bethpage, N.Y.

Already a leader in the design and construction of military and private aircraft and sophisticated space vehicles, Grumman in 1965 appraised the oceanographic field and, rightly, I believe, saw there great potential.

In order to contribute to solving these problems of offshore mining, fish study, national defense, and the study of basic physical phenomena, it was decided to turn the vast engineering talent of the company to the development of a submersible vehicle, a work submarine which could bring man into the undersea environment to observe and perform useful tasks there.

About this time I became an exclusive consultant to Grumman, and after several studies, it was decided to build a mesoscaph or middle-depth submarine (from the Greek words for "middle"-"meso" and "ship"-"scaph"). It was to be based on a design I had prepared for an earlier submarine, the first mesoscaph, the "Auguste Piccard," named for my father.

Subsequently, the PX-15, as the Grumman submersible was called, was built in Switzerland at the same factory which constructed the first vessel. In about 1 year the PX-15 was practically fully completed. In early March it was partially disassembled--to allow it to pass by railroad through our Swiss tunnels to Antwerp, where it was loaded on a merchant ship and transported to the Grumman facility in West Palm Beach, Fla.

Grumman engineers and several of my staff have been engaged since April in the final outfitting of this unique research submarine. The vehicle is built of high-strength steel and is about 50 feet long and about 130 tons in weight, making it the largest research submarine in the world. It can dive to 4,500 feet before collapsing, but we shall limit its operation to 2,000 feet. The live support system can sustain six men for 6 weeks, giving us a great deal more submerged endurance than any other research vehicle.

And 29 portholes, a closed-circuit television system as well as fixed external cameras and recording devices assure that we can observe and document the underwater secrets we uncover.

The various unique features of the Grumman-Piccard PX-15 admirably suit it for our first major undertaking, a kind of undersea adventure, with "science nonfiction" objectives.

Early next year the submarine with six men, including myself, on board will submerge off the Florida coast and drift in midwater at depths of 300 to 2,000 feet, propelled northward for 4 to 6 weeks only by the current of the Gulf Stream.

The scientists will conduct a series of long- and short-duration experiments concerning the mysterious Deep Scattering Layer, which "tricks" navigators by sending back false echoes on their fathometers and has implications in fish-feeding and marine-life cycles, on bottom topography, acoustics, marine biology, and fish habits, as well as analysis of the water's chemical properties, temperature, and speed.

The program is to be a cooperative enterprise with the U.S. Naval Oceanographic Office providing the all-important surface support ship (to give us navigational information) and two of the scientific observers on board the submarine.

When the Gulf Stream Drift Mission is terminated, probably 1,000 miles later off the coast of Massachusetts, the people at Grumman will make the submersible available on a lease basis to those who can best utilize its special depth, endurance, and large payload capabilities.

Just 2 weeks ago here in Washington, at a convention, we announced that the PX-15 henceforth will be known as the Ben Franklin, honoring your early American scientist-statesman, the man who first recognized the practical advantages of knowing and defining the limits of the Gulf Stream.

Franklin, as head of the U.S. Post Office, learned that British mail packets sailing from England, took 2 or 3 weeks longer to cross the Atlantic than Nantucket whalers returning from Europe. A conversation with some of the Yankee skippers brought the fact that they

avoided the Gulf Stream while the English "bucked" the current much of the way.

Franklin then asked several of the New England whalers to make temperature readings throughout the North Atlantic and from these reports he charted the first map of the Gulf Stream. He turned it over to the British General Post Office, and we can assume that a substantial decrease in the London-to-Philadelphia mailing time followed shortly.

Just this week at the West Palm Beach facility we will begin dockside tests of the Ben Franklin, and on August 21 we will hold the formal christening ceremonies.

This Grumman program will involve more than $4 million of company funds, and it is just one of many pioneering efforts, some supported wholly or in part by Federal money, others purely company sponsored.

The important point, however, is that basic research into the workings of the world beneath the waves is moving forward. The Naval Oceanographic Office and the Office of Naval Research are spearheading this assault on the unknown, and scientists the world over acknowledge the preeminent position these agencies along with ESSA, the Bureau of Commercial Fisheries, and others occupy in the advancement of man's understanding of the oceans.

DO YOU KNOW?

Fish have "nurseries." These are the estuaries, which are among the world's most productive areas and include the bays, sounds, and nearshore areas that surround our coasts.

It is to these nutrient-rich waters that the "baby" salmon, shad, pompano, shrimp, and other important food fishes come to feed and grow until they have passed their "adolescent" stages and are ready to move into deeper water as adults.

Estuaries provide essential living space for more than 70 kinds of fish and shellfish that contribute 3 billion pounds, or two-thirds, of the total U. S. commercial fishing catch. Seven of the ten species most in demand, including shrimp, our most valuable fishery, and menhaden, our largest fishery, must have suitable estuarine nurseries.

Pollution of estuarine areas by chemical and human wastes, pesticides, and dredging and filling reduces important nursery areas. The result is a decrease in the commercial catch and less food for our growing population.

The estuaries are the "fishbasket" of our nation. It is vital that the best possible use be made of them for the benefit of all. BCF works with other government agencies to foster multiple use of these estuaries--but still protect those valuable natural resources.

--Catherine Criscione

U.S. AND JAPAN CONDUCT SUCCESSFUL SALMON RESEARCH CRUISE

By Robert R. French and Richard Bakkala

In a Commercial Fisheries Review article, May 1968, BCF's Seattle (Wash.), Biological Laboratory announced plans for cooperative research by the U.S. and Japan to study the distribution of salmon on the high seas. The two nations and Canada, as treaty members of the International North Pacific Fisheries Commission (INPFC), conduct research on fishery resources of common interest for effective utilization and conservation.

In the INPFC treaty of 1953, Japan agreed to abstain from salmon fishing on the high seas east of long. 175° W. Since then, however, we have found that sockeye salmon from Bristol Bay migrate westward past the abstention line in varying proportions.

One objective of the cruise was to investigate the possibility of forecasting the percentage of the run available to the Japanese fishery each year. We also wished to test the hypothesis that the distribution and migration of sockeye salmon from Bristol Bay are related to specific water masses in the North Pacific Ocean.

This report gives preliminary data on the catches, and the location of these catches in relation to water masses, in April, May, and June. We also report results of predation studies by the BCF vessel.

Vessels and Fishing Gear

The participating vessels were the Seattle Biological Laboratory's R/V "George B. Kelez" (550 tons) and the Japanese research vessels "Wakashio-Maru" (150 tons) and "Hokko-Maru" (220 tons), all shown in figure 1. The three vessels fished with gill nets of various mesh sizes; the Japanese also used longlines for capturing salmon to be tagged. The tagging data are not reported here. The U.S. vessel fished a basic net string of 32 shackles (1.8 miles or 2.9 km. long) with five mesh sizes ($2\frac{1}{2}$, $3\frac{1}{4}$, $3\frac{7}{8}$, $4\frac{1}{2}$, and $5\frac{1}{4}$ inches--63, 83, 98, 115, and 113 mm.), stretched

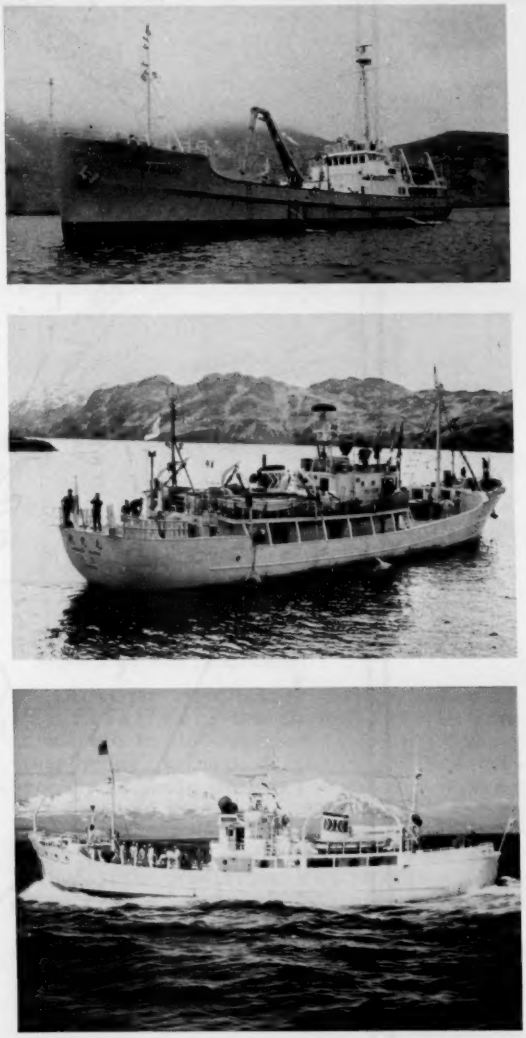


Fig. 1 - Cooperating research vessels--George B. Kelez (U.S.), Hokko-Maru and Wakashio-Maru (Japan).

The authors are Fishery Biologists, BCF Biological Laboratory, 2725 Montlake Boulevard East, Seattle, Wash. 98102.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 830

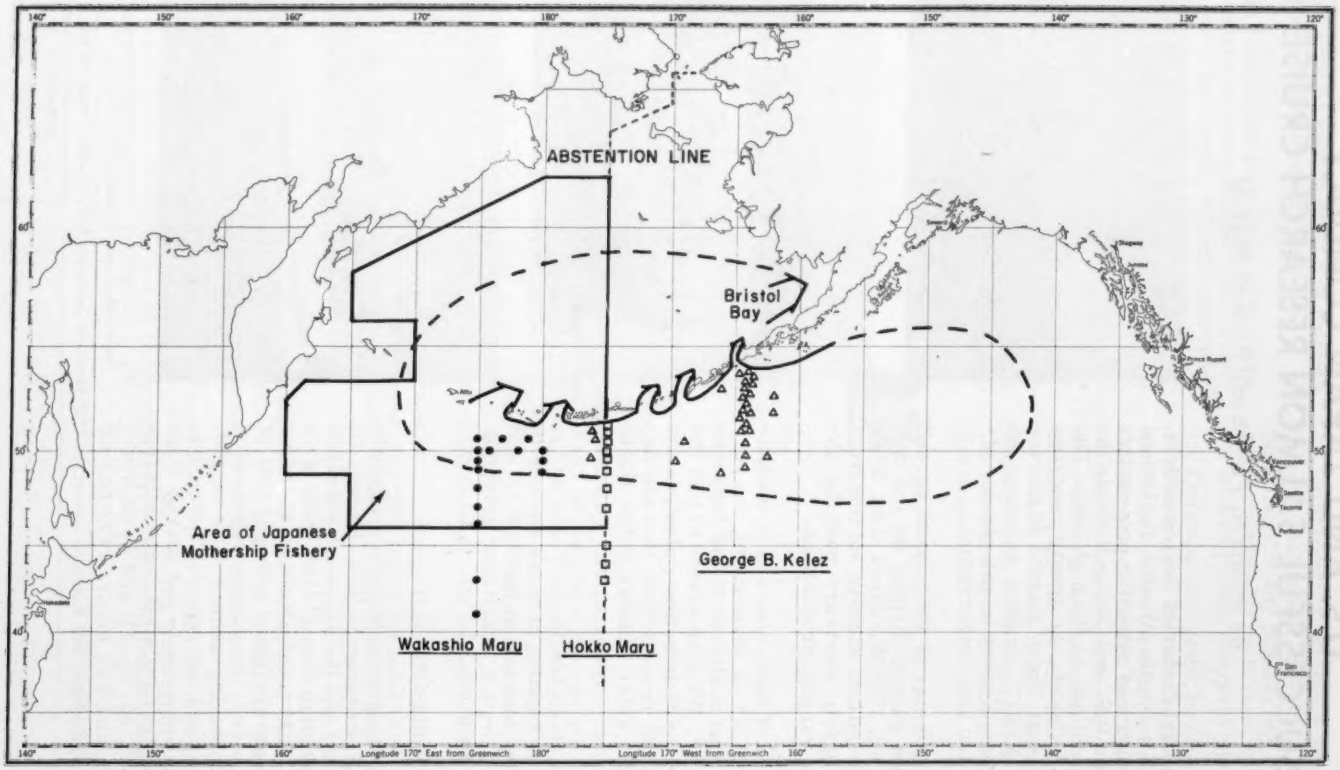


Fig. 2 - Stations fished by U.S. and Japanese research vessels and limits of distribution and migration routes for Bristol Bay sockeye salmon in relation to the mothership fishing area and abstention line.

measure. The Japanese vessels fished a basic string of 50 tans (2.5 km.) and 75 tans (3.75 km.), consisting of five mesh sizes (2.1, 2.8, 3.6, 4.8, and 6.1 inches--55, 72, 93, 121, and 157 mm.).

Communications

The language difference prevented voice communication, but vessel activity was coordinated by use of the International Code. This method of communication proved satisfactory; it allowed daily radio schedules in which data were exchanged on vessel position, catch by species, number of gill nets fished, and water temperatures at various depths. The Kelez also communicated daily with the Seattle Laboratory via single side band radio. It sent catch results and oceanographic data; in return, the vessel received the positions of the various water masses to guide scientists in planning fishing stations.

Fishing Results

Fishing stations of the three vessels in relation to migration routes of maturing Bristol Bay sockeye salmon--and the area of the Japanese mothership fishery--are shown in figure 2. The Kelez fished in April, May, and June, primarily south of the eastern Aleutian Islands; the two Japanese vessels fished in May south of the central and western Aleutian Islands.

Sockeye salmon were widely distributed in April and May. The maturing and immature fish showed differences in distribution (fig. 3). Maturing sockeye salmon (to spawn in 1968) were in the Ridge, Oyashio Extension, and Subarctic Current Areas of the Subarctic Region, but not in the Transition Area. The one set in the Alaskan Stream also took no maturing fish. Immature fish (those that will remain at sea at least 1 more year) were primarily in the southern water masses--the Oyashio Extension, Subarctic Current, and Transition Areas--but were not taken south of lat. 46° N. By early June, maturing fish were relatively abundant in the northern part of the sampling areas in the western Gulf of Alaska (fig. 4). These salmon were en route to Bristol Bay; the main group migrated through this area from June 1 to 10. By the middle of June, the relative abundance of maturing sockeye salmon had decreased, and immature fish had appeared throughout the Ridge Area.

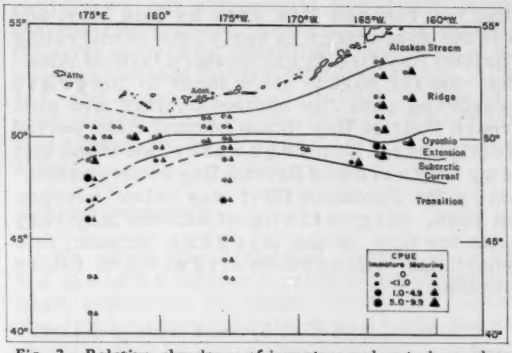


Fig. 3 - Relative abundance of immature and maturing sockeye salmon in April and May and location of water masses in the Subarctic Region of the North Pacific Ocean.

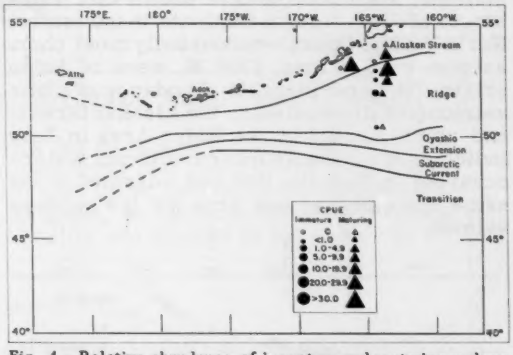


Fig. 4 - Relative abundance of immature and maturing sockeye salmon in June and location of water masses in the Subarctic Region of the North Pacific Ocean.

Of major significance was the indication that relatively few Bristol Bay fish were available to the Japanese high-seas fishery this spring. In the past, maturing Bristol Bay sockeye salmon were observed migrating westward from the Gulf of Alaska, thence northward through the eastern and western Aleutian passes. This route took part of the run past the provisional abstention line at long. 175° W., where the fish were vulnerable to the Japanese mothership fishery. The proportion of the Bristol Bay sockeye salmon available to the mothership fishery varies from year to year for reasons not yet understood.

Evidently no major migration of maturing Bristol Bay fish passed the abstention line in 1968. This was indicated by: (1) the low abundance of sockeye salmon along long. 175° W., which shows that Bristol Bay fish

had not reached this area by late May, and (2) the appearance in early June of migrating Bristol Bay fish in the western Gulf of Alaska--too far east to allow them to migrate westward past the abstention line and still reach Bristol Bay in the normal time period (early July). Subsequently, we found that exploitation of Bristol Bay sockeye salmon by the Japanese fleet was below average in 1968. Migrations of salmon may vary with the flow of the Alaskan Stream; this possibility will be investigated in future studies.

Chum salmon (fig. 5) were widely distributed in more southern waters on the two western cruise tracks, but they were farther north in the areas fished by the Kelez at the eastern stations. Past studies have shown that Asian stocks of chum salmon dominate in the central North Pacific Ocean--undoubtedly most chum salmon west of long. 175° W. were of Asian origin. The considerable abundance of chum salmon (not illustrated) in the Alaskan Stream and northern part of the Ridge Area in June indicates a northerly movement from waters occupied in May; the fish had migrated in the same time period and area as the sockeye salmon.

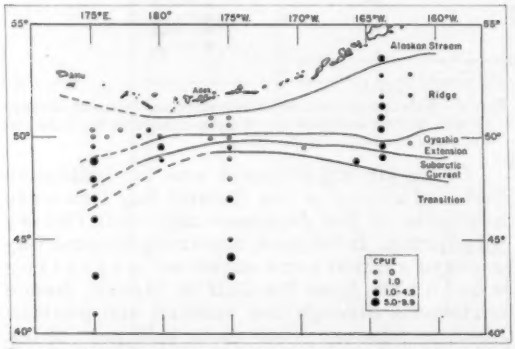


Fig. 5 - Relative abundance of chum salmon in April and May and location of water masses in the Subarctic Region of the North Pacific Ocean.

The distribution of pink salmon was similar to that of chum salmon (fig. 6). In the western part of the sampling area, they appeared in the southern water masses and were not generally abundant in the Ridge Area. In the eastern section, in May, they were most abundant in the southern part of the Ridge and Oyashio Extension Areas. By June, they were abundant in the northern part of the Ridge Area and Alaskan Stream (not illustrated).

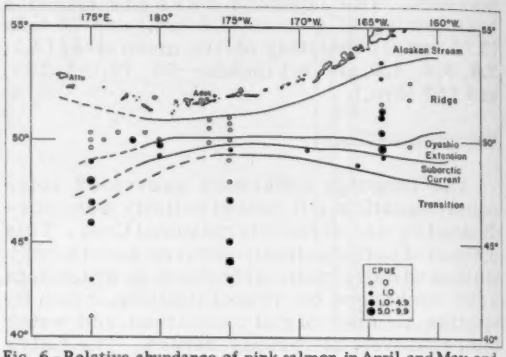


Fig. 6 - Relative abundance of pink salmon in April and May and location of water masses in the Subarctic Region of the North Pacific Ocean.

Predation

The George B. Kelez also conducted experiments on predation of salmon caught in gill nets. It has long been known that sea lions, fur seals, birds, and sharks feed on salmon in gill nets. The effect of the predation on catch rate, however, has not been determined. The method used was to attach freshly frozen salmon from the previous night's catch to the gill nets at time of setting; the numbers remaining were tallied when nets were hauled in the morning.

Total losses of "decoy" salmon amounted to about 29%. Loss was about 35% for fish attached to the corkline, and 21% for fish on the leadline (about 25 ft. or 7.6 m. below the surface). The greatest losses were at stations where we saw sea lions around the nets.

Losses of decoy fish decreased as distance from shore increased (fig. 7). Beyond 100 miles from shore, the loss was less than 20%, and in two of four sets no decoy fish were lost. Within 100 miles of shore, loss of decoys ranged from 22 to 90%.

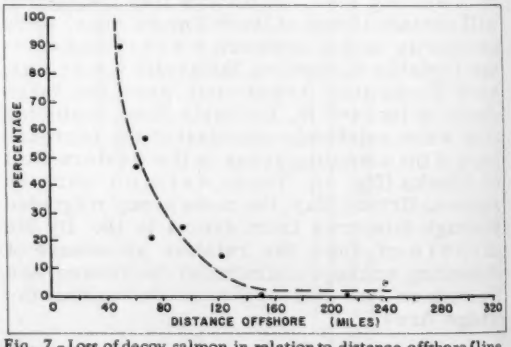


Fig. 7 - Loss of decoy salmon in relation to distance offshore (line fitted by inspection).

That salmon in gill nets are lost to predators is beyond question, but it is also necessary to evaluate the effect on catch rates in gill nets. A problem in present techniques is that live salmon may be taken by predators at any time during the night, whereas decoy fish are exposed to predators throughout the time the nets are in the water.

Effectiveness of Cooperative Cruise

This first cooperative cruise by researchers of the U.S. and Japan was successful. Despite language problems, effective communication between vessels was achieved. The results clearly demonstrate how much more rapidly we can accumulate knowledge about the distribution and migration of salmon in offshore waters by coordinated operations of several vessels fishing simultaneously. The U.S. and Japan soon will prepare a joint report of the findings for the INPFC. We expect this type of cooperative research to continue.

Acknowledgments

We thank the Fisheries Agency of Japan for use of the Japanese catch data--in particular, scientists M. Osako and J. Ito aboard the Hokko-Maru, and M. Katsuagi and G. Hoshiai aboard the Wakashio-Maru.

WHAT IS THE MOST IMPORTANT DISCOVERY MADE ABOUT THE OCEANS?

One of the most important discoveries about the oceans is the true nature of the sea floor. Not so long ago it was generally believed that much of the deep ocean floor was a featureless plain. We now know that there are numerous mountains under the sea, some of them higher than Mt. Everest. But perhaps the most striking discovery is that all oceans except the North Pacific are divided in the center by an almost continuous system of mountains.

Some of the other important discoveries are:

Discovery in 1938 of the coelacanth, a fish thought to have become extinct 50 to 70 million years ago, but which was found to be thriving off South Africa.

Discovery of a layer of living organisms spread over much of the oceans at a depth of several hundred fathoms (deep scattering layer).

Discovery of nodules of manganese, cobalt, iron, and nickel which can be dredged from the sea floor.

Discovery that the earth's crust is much thinner under the sea than under the land and that the bed of the ocean is underlain by basalt rather than by granite which makes up the continents.

Discovery of a deep sound channel that carries sounds for thousands of miles.

Discovery of life in the deepest parts of the oceans.

Perhaps the most important recent discovery is that man can live and work in the ocean for extended periods of time. Captain George F. Bond, a medical officer in the United States Navy, discovered that, once a diver's blood has become saturated with breathing gases at a given depth, decompression time is related only to the depth and not to the length of time the diver remains there. This led to the concept of underwater habitation by Cousteau and Link. ("Questions About The Oceans," U. S. Naval Oceanographic Office.)

For commercial fishermen, it is efficient means to take buffalo. For States seeking commercial gear to replace gill net, it is at least a partial solution.

A FLOATING TRAP NET FOR USE IN RESERVOIRS

By Gary Ackerman and Marvin F. Boussu

The trap net described here was designed and built by the senior author for a commercial fisherman who furnished the materials and helped to construct it. Essentially, the gear is a small trap net that uses a hoop net for the pot or crib section. The 200-foot-long lead and the two 40-foot-long wings are 18 feet deep (fig. 1). The heart section is 30 feet long and tapers from 18 feet square in front to 7 feet in diameter, where it ends with a hoop attached to the body of a standard hoop net. The crib section is seven 7-foot hoops

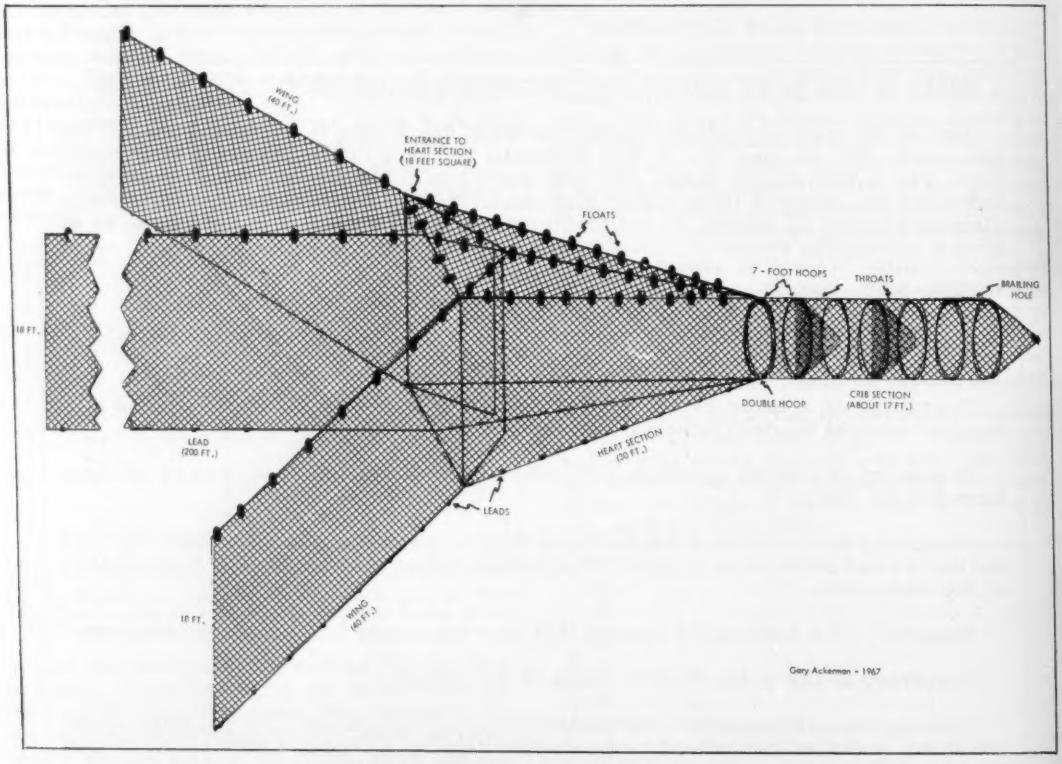


Fig. 1 - Construction diagram of floating trap net.

Mr. Ackerman is with the Iowa State Conservation Commission, 206 Seventh Street SW., Independence, Iowa 50644.
Mr. Boussu is a Fishery Biologist, BCF Exploratory Fishing and Gear Research Base, 5 Research Drive, Ann Arbor, Michigan 48103.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 831

spaced $2\frac{1}{2}$ feet apart. Throats are at the second and fourth hoops, and a laced brailing hole is at the top between the sixth and seventh hoops. A system of corks floats the gear, and leads on the bottom lines give it vertical stability.

Construction materials were: Webbing--No. 18 nylon thread; lines--$1\frac{1}{4}$-inch braided nylon; plastic floats--3 by 4 inches; leads--No. 6; and oak hoops--7-foot diameter. Mesh size throughout is 7-inch stretch measure.

Use and Results

The net was designed primarily to take bigmouth buffalo. For this reason, it is floated on the surface (fig. 2).

The lead is usually placed perpendicular to shore and from shore to net, although "openwater" sets also are practical. The net is set by fastening the tag end of the lead to shore, stretching the lead and net out longitudinally, anchoring the crib, and then anchoring the wings in position. The crib anchor rope is 100 feet long and the wing anchor ropes are 50 feet long. The wing anchor ropes are yoked about 30 feet from the anchor with one line leading to the bottom line and the other to the float line. The gear has not been fished on the bottom, but this could be done by a change in the float-lead ratio. We recommend that the net, as now rigged, not be set in water depths over 30 feet. To fish depths greater than 30 feet would require anchor lines longer than those used at present to prevent excessive downward pull that would cause disfiguration of the net or submergence of float lines. The weight of longer anchor lines would probably require more floats at the wing and lead tips, and on the crib section.

Fig. 2 - Floating trap net in fishing position on Oahe Reservoir, S. Dak. In this set the lead extends to shore. Note floating debris--a common problem on this newly formed reservoir.

This gear is economical to fish because one man in a small boat can set, move, and fish the net. The facts that anchors instead of stakes are used to hold the net in place, and only the pot is raised to remove fish, account largely for the ease of operation.

The net caught fish effectively in two reservoirs. It was first fished commercially August 4 to 17, 1967, in Lake Oahe, South Dakota. During the 14 days of fishing, the net was lifted seven times. Bigmouth buffalo constituted 93 percent of the catch by number and weight (table). Average catch per lift was 74 buffalo with a dressed weight of 296 pounds. The catch was outstanding because August is usually a poor month for taking buffalo in Lake Oahe. Catches with the new net were considerably greater than with standard hoop nets fished concurrently in the area. The commercial fisherman later fished in Lake Sakakawea, North Dakota, and reported that the net continued to be an efficient gear.

Number, Dressed Weight, and Percentage Composition of Fish Taken in Seven Lifts with A Floating Trap Net in Lake Oahe, August 4-17, 1967

	Total Catch			
	Number	Percent	Dressed Weight in Pounds	Percent
Bigmouth buffalo	519	93	2,070	93
Carp	15	3	73	4
River carpsucker	15	3	47	2
Blue sucker . . .	8	1	28	1
Northern pike . .	1	tr.1/	8	tr.1/
Total . . .	558		2,226	

1/Less than 0.5.

The limited fishing data indicate that the net has potential as a commercial gear and is highly selective toward bigmouth buffalo. In additional testing, we suggest that baiting might improve the catch rate, especially of "openwater" sets.

THIS CHRISTMAS TREE IS SHRIMPLY DELICIOUS

In answer to many requests, the United States Department of the Interior's Bureau of Commercial Fisheries has once again released instructions for its Shrimp Christmas Tree for the most exciting holiday table in the neighborhood.

From a commanding position on a buffet table or as a colorful centerpiece for a well-appointed holiday dinner, this unusual tree is certain to capture compliments. Leafy green endive duplicates crisp holly while ever-popular shrimp add shape and color interest to this creative conversation piece.

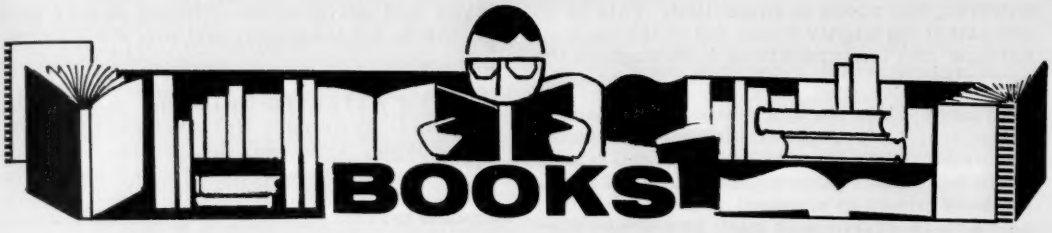
This intriguing tree is elegant but deceivingly simple. The materials are readily available at most local variety stores and supermarkets.

SHRIMP CHRISTMAS TREE

3 pounds shrimp, fresh or frozen
2 quarts water
½ cup salt
4 large bunches curly endive
1 styrofoam cone, 2½ feet high
1 styrofoam square, 12 x 12 x 1 inch
1 small box round toothpicks
Cocktail Sauce

Thaw frozen shrimp. Place shrimp in boiling salted water. Cover and simmer about 5 minutes or until shrimp are pink and tender. Drain. Peel shrimp, leaving the last section of the shell on. Remove sand veins and wash. Chill. Separate and wash endive. Chill.

Place cone in the center of the styrofoam square and draw a circle around the base of the cone. Cut out circle and insert cone. Cover base and cone with overlapping leaves of endive. Fasten endive to styrofoam with toothpick halves. Start at the outside edge of the base and work up. Cover fully with greens to resemble Christmas tree. Attach shrimp to tree with toothpicks. Provide Cocktail Sauce for dunking. Serves 12.



AQUARIUM FISHES

"Unusual Aquarium Fishes," by Alan Mark Fletcher, J. B. Lippincott, Philadelphia, 1968, 143 pp., illus. The aquarium hobby is one of the largest in the world; nearly 20 million people in the U.S. alone keep fishes in aquariums. Despite this interest, few aquarists know little more than how to feed their pets. But many of the fishes commonly kept in aquariums are more than beautiful. They have habits and characteristics so bizarre as to defy credibility. There are fish that swim upside down, fish that walk on dry land, and fish that can see in and out of the water at the same time.

Mr. Fletcher offers descriptions and photographs of 35 kinds. Some of the photographs are remarkable, showing the fishes actually doing what makes them unusual.

FISHES

"A Draught of Fishes," by F. D. Ommanney, Thomas Y. Crowell, New York, 1966, 254 pp., illus., $6.95. A distinguished marine biologist describes fish: their life, breeding, and movements; methods of fishing and fish feeding, fish as harvest, and fish as food. The techniques of trolling, trawling, and longline fishing are graphically demonstrated. Readers who know fishing chiefly as sport will learn how fish are farmed to feed teeming populations, what is being accomplished in international cooperation in fishery research, and what we can expect in sea harvests in the near future.

FRESHWATER FISH PRODUCTION

"The Biological Basis of Freshwater Fish Production," edited by Shelby D. Gerking, John Wiley & Sons, New York, 1967, 495 pp., illus. Fresh-water fish production has made a substantial contribution to human nutrition and well-being over the years. Its contribution in the future will be vital in supplying protein to an increasing human population.

This book, a Symposium on Productivity of Freshwater Communities, stems from a technical meeting sponsored by the International Biological Program. It should be a landmark in the establishment of sound scientific principles for freshwater fish production. The Symposium is divided into 5 categories: (1) vital statistics of population, (2) relation of fish population to the food supply, (3) competition and behavior, (4) predation and exploitation by man, (5) the contribution of freshwater fish to human nutrition.

GULF OF MEXICO

"Illustrated List of Common and Scientific Names of Fish from the Gulf of Mexico, in Latin, Spanish, Russian, and English," JPRS No. 46741, compiled by Milton M. Rose, Clearinghouse, Springfield, Va. 22151, $3.00. This is a glossary of 129 fishes from the Gulf of Mexico.

MAPS

"Seafloor Topography of the Central Eastern Pacific Ocean," Circular 291, by Thomas E. Chase, Fish and Wildlife Service, Dept. of the Interior, 1968, 33 pp. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209. The offshore configuration of the floor of the eastern Pacific is presented on 26 topographic charts. Mr. Chase describes the methods and data used in their preparation and gives a general outline of the major topographic features. He has searched and evaluated all existing data pertinent to the sea floor topography, contoured the region in detail, and labeled the prominent undersea geological features.

OCEANS AND OCEANOGRAPHY

"The Frail Ocean," by Welsey Marx, Coward-McCann, New York, 1967, 248 pp., illus., $5.95. The ocean has increasingly and, justly, come to be regarded as a vast resource--a source to be fully explored and exploited. So long as exploitation remains a key work,

however, the ocean is imperiled. This is an account of the mighty ocean and of the delicate balance that has preserved it throughout the centuries. Today that balance is in jeopardy.

Wesley Marx writes with lyric joy of the ocean's splendor, communicating his sense of wonder at its enormous power and fertility, as well as his growing fear for its future. The book makes an eloquent plea--a plea that grows more urgent with each new ocean disaster--for the preservation of the seas and their myriad inhabitants.

"Uses of the Seas," edited by Edmund A. Gullion, Prentiss-Hall, Englewood Cliffs, N. J., 1968, 204 pp. A protein harvest from the seas. Oil well 285 feet underwater. Entire submarine cities. A fantastic vehicle that gathers minerals from the ocean floor. These and other technological marvels could easily start a new era of thoughtless imperialism. Edmund A. Gullion and a group of distinguished economists, political scientists, foreign policy experts, and oceanographers urge that the U.S. explore in advance the political and military defenses against such a threat.

They also answer such critical questions as: How much can sea technology benefit the underdeveloped countries? To what extent should nations and international organizations seek to "legislate" the uses of the sea? Can sea technology affect the U.S.-USSR strategic balance? What are the consequences of British withdrawal from strategic waters? Their answers help explain the direction of American policy and the unprecedented challenges to international stability. This book was designed as a background volume for the American Assembly, a nonpartisan educational organization. It provides a wealth of thought-provoking material.

"Your Future in Oceanography," by Norman H. Gaber, Richards Rosen Press, New York, 1967, 143 pp., illus., $4.00. This book is one of a series written for the student who is interested in choosing a major career that is more than just a job. It is written on the premise that an oceanographer must know more than his own laboratory, office, or ship. He needs a grasp of the whole discipline: of who is doing what, and why, and how.

Mr. Gaber describes oceanography, the related sciences, and marine engineering, and explains the organization, future, and business of oceanography. He lists the colleges and universities offering degree programs in oceanography and marine science.

SALMON

"The Atlantic Salmon. A Vanishing Species?" by Anthony Netboy, Houghton Mifflin, Boston, 1968, 457 pp., illus. Once the Atlantic salmon roamed over half the northern hemisphere, from the Arctic and Atlantic Oceans to rivers running deep into the interior of Europe and North America. In many lands it has been pursued so relentlessly--and so many barriers have been strewn along its migratory routes--that the fish are seen no more.

The species has utterly vanished from Portugal, Switzerland, Denmark, the Low Countries; it is in danger of extinction in France and Spain. Apart from the difficulties of keeping rivers inviolate, the salmon's life in the sea is now threatened by the discovery of at least part of its feeding haunts and migratory routes in the North Atlantic. Mr. Netboy has written a fascinating account of the salmon, its past, and its probable future in the countries where it still spawns. He warns of its possible extinction without some regulation of the high-seas salmon fishery.

SEA OTTERS

"Sea Otters and the China Trade," by Robert Kingery Buell and Charlotte Northcote Skladal, David McKay, Co., 212 pp. Sea otters--what are they? Few people have seen one, and almost no one is aware of the animal's place in American history. Highly valued by the ancient mandarins of China for their beautiful shimmering fur, they were the basis of a lucrative trade with the Far East that drew men to the west coast of America even before the U.S. was a nation.

The hundred years of indiscriminate hunting from 1741 to 1841 exterminated most of them. By 1841 the Russians had moved out of California and the early wagon trains were climbing over the Sierra Nevada. The dream of an America that swept across a continent was nearly a reality, but the herds of sea otter that had started the whole cycle of commerce and trade along the coast had disappeared from the kelp beds. In 1911, an international treaty was signed by Great Britain, Japan, Russia, and the U.S. protecting the fur seals, sea otters, and polar bear in the north Pacific. The authors have written a stirring tale of the sea otters and the men who hunted them.

"Sea Otter," by George Seymour, article, "Outdoor California," Vol. 29, No. 4, July-Aug. 1968, pp. 11-12, illus. Available as a Wildlife Leaflet from the California Dept. of Fish and Game, 1416 Ninth St., Sacramento, Calif. 95814. The colorful, playful sea otter is making a slow, steady comeback after being hunted to the verge of extinction. By the turn of the 19th century, after 170 years of exploitation, only a few were left along the coast of California, and in some of the islands off the coast of Alaska. There are now between 500 and 600 of these gentle creatures living along the central California coast, and 30,000 to 40,000 in Alaskan waters.

Mr. Seymour briefly describes the animal, its life history and feeding habits, and the trade that caused its near extinction.

SEAWEED

"Irish Moss--A Growing Resource," by James Kinlock, article, "Fisheries of Canada," Oct. 1968, vol. 21, no. 4, pp. 3-7, illus. Seaweeds, in particular the one known as Irish moss, are becoming increasingly important to northeast Atlantic coast fishing communities. Mr. Kinlock describes the plant, its present harvesting and uses, and its place in the plans for all Canadian regions where there is a potential seaweed industry.

"Utilization of Kelp-Bed Resources in Southern California," Fish Bulletin 139, edited by Wheeler J. North and Carl L. Hubbs, Dept. of Fish and Game, Resources Agency of California, 1968, 264 pp., illus. The general objective of this bulletin is to assess the impact of man's past, present, and future activities on the kelp-bed environment. Chief emphasis has been given to problems concerning possible effects of kelp harvesting, particularly any effects on fish life. When kelp beds regress or disappear, both kelp harvesting and fishing suffer.

The contributors examine the diets, behavior, preferred habitat, abundance, and life history of kelp fishes. They show the ecological roles played by kelp as a food source and shelter, and in phytoplankton productivity.

SHAD

"The American Shad," FL-614, by Randall P. Cheek, Fish and Wildlife Service, Dept. of the Interior, August 1968, 13 pp., illus. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209. The American shad, Alosa sapidissima, is one of the best known fishes of the Atlantic coast. It is found from the St. Lawrence to the St. John River in Florida in sufficient quantities to support fisheries of great commercial and recreational values. Like the salmon, the shad spends most of its life in the ocean, returning to freshwater streams to spawn; like the salmon, too, it is subject to the hazards of dammed and polluted rivers and overfishing.

If annual production of shad could be restored to 19th century levels, the commercial catch would be worth more than $6.5 million, and the sport fishery would provide many additional man-days of fishing. Mr. Cheek describes the life history of the shad, the commercial and sport fishery, and summarizes the status of research and management of the species.

UNITED KINGDOM

"Torry Research Station Annual Report 1967," Ministry of Technology, London, 1968, 50 pp., illus., $1.30. Available from British Information Services, 845 3rd Ave., New York, N. Y. 10022. The main object of the Torry Research Station's work is to ensure that there is as little deterioration of quality as possible from the time a fish is caught to the time it is eaten. Most of the work has been concerned with handling traditional species, such as cod, and with the techniques of freezing at sea.

During 1967, station personnel investigated the merits of boxing fish at sea, superchilling, and other methods of preservation; distribution methods; quality control; prepackaging of wetfish; use and development of new machines; and preservation and presentation of nontraditional species. The Annual Report is intended for people in the fish industry and interested members of the public. Technical jargon and scientific terminology have been eliminated.

--Barbara Lundy

INTERNATIONAL

1967 World Fish Catch Sets Record

World fish catch set a record in 1967, according to the Food and Agriculture Organization of the United Nations (FAO). Marine and freshwater catch was 60.5 million metric tons, almost twice the 31.5 million caught a decade before, and more than three times the 1948 catch.

Peru, already the world's first fishing nation in quantity, became the first to take more than 10 million tons--almost all anchoveta used for fish meal. Japan was second with 7.8 million tons, trailed by the Soviet Union with 5.8 million. No information was available on Mainland China, whose 1960 catch was estimated at 5.8 million. FAO included this figure in the world catch, but assigned China no rank. Norway was 4th with 3.2 million; the U.S. placed 5th with 2.4. Canada, 1,289,800 tons, ranked 9th after South Africa, Spain, and India. Denmark broke the million-ton mark for the first time. Chile and the United Kingdom each caught over 1 million tons. Indonesia, which did not report data for 1967, had reported 1.2 million in 1966.

Nations Under 1 Million Tons

Iceland caught 1.2 million tons in 1966, but was down to 896,000 in 1967. Thailand, France, the Philippines, South Korea, and West Germany all caught over 600,000 tons. Taiwan, Pakistan, Malaysia, Mexico, Poland, Sweden, Italy, and the Netherlands each reported over 300,000.

Morocco, Angola, Argentina, the Faeroes, Senegal, Tanzania, Ceylon, Chad, Ghana, and Venezuela caught more than 100,000 tons each. Other countries that did not report 1967 data but were estimated to have caught over 100,000 tons were Brazil, Burma, Cambodia, South Viet-Nam, East Germany, Greece, Portugal, Turkey, North Korea, and North Viet-Nam. Countries with catches of less than 100,000 tons included Australia, Finland, Belgium, Romania, and Israel.

Major Species Fished

More marine herrings, sardines, anchovies, pilchards, and menhadens--19.7 million tons--were taken than any other group. The second most important species were cods, hakes, and haddocks, followed by redfishes, basses, mackerels, and billfishes.

Latin American and Soviet fishermen caught 675,000 tons of Patagonian hake in the Southwest Atlantic, compared with 183,000 in 1966. Most of the increase was due to the Soviets, whose catches leaped from 56,000 tons in 1966 to 513,000 in 1967.

Productive Areas

The Southeast Pacific was the most important fishing area in terms of weight. It provided 11.2 million tons. The western-central Pacific was next with 10.5 million, followed by the Northeast Atlantic's 10.2 million. In the North Pacific, the total was 6.4 million tons, and in the Indian Ocean, 2.1 million. Catch from inland waters was 7.2 million tons, including salmons, eels, and other migratory species.

North Pacific Fisheries Commission Holds 1968 Meeting

The International North Pacific Fisheries Commission (INPFC) ended its 15th annual meeting at Seattle, Wash., on Nov. 8, 1968. For 3 weeks, the participants discussed aspects of international cooperation to conserve high-seas fishery resources.

Preceding the meeting, scientists from Canada, Japan, and the U.S. reviewed results of their research in 1968 on salmon, halibut, king crab, and groundfish resources. They reported their findings for the Commission's guidance. They also exchanged information on high-seas fishing during 1968.

Halibut Fishing in Eastern Bering

A principal task on the Commission's agenda was to develop halibut fishing regulations for the eastern Bering Sea in 1969. The Commission has been doing this since 1963, when line fishing there was opened to all 3 countries.

The Commission recommended continuation of 1968 conservation measures. It suggested the complete closure to halibut fishing of an extensive area in the southeastern Bering Sea, a nursery ground for young halibut. The Commission was assisted by a scientific consultant from the International Pacific Halibut Commission.

Gulf of Alaska

In the Gulf of Alaska, the Commission focused on the effects on halibut stocks of expanding trawl fisheries for other species. Groundfish catch statistics were exchanged and studied. The Commission approved recommendations by its Gulf of Alaska Groundfish Committee for further research. The Commission's Canadian and U.S. sections urged greater efforts to get more data on the interrelationship of trawl and longline halibut fisheries.

Groundfish Other Than Halibut

Considering research on groundfish other than halibut in the northeastern Pacific, the Commission considered existing bilateral regulations inadequate. It agreed to forward its findings to the 3 governments.

Tanner Crab

The U.S. asked the Commission to study tanner crab resources of the eastern Bering Sea. The Commission agreed.

Scientific Reports

The Commissioners reviewed the progress of its program to publish scientific reports. Several major papers resulting from its research were published in English and Japanese versions in the INPFC Bulletin. These included the completion of a 9-part comprehensive report on North Pacific salmon.

The next annual meeting will be held in Vancouver, Canada, beginning Nov. 3, 1969.

Nordic Conference Held on Atlantic Salmon

Delegates to the Nordic Fishery Conference, held at Aarhus, Denmark, Aug. 29, 1968, were very concerned about high-seas fishing for Atlantic salmon. Salmon have been taken for many years in the Baltic. In recent years, more than half the catch was landed by Danish fishermen.

Another high-seas salmon fishery developed recently off West Greenland. These fish could not be of Greenlandic origin because Greenland has only one salmon-producing river. It has been supposed that salmon from both Europe and North America have one or more common feeding areas in the North Atlantic. This abrupt mass appearance may be the result of the formation or extension of such a foraging area--and the fish could disappear as suddenly as they appeared.

Norway Bitter

At the Conference, Norway was especially bitter about Danish high-seas salmon fishing. She believes the Danes are reaping the rewards of Norwegian and Swedish conservation practices. Sport-fisheries salmon catch in Norway, Sweden, England, and Scotland may be of equal or greater importance than the commercial catch. Denmark's rivers produce relatively few salmon. Gear improvement--synthetic fibers for long lines--has changed a previously seasonal fishery into a year-round one.

Danish Position

The Danes claim that increased oceanic salmon fishing has not resulted in decimation of stocks, and that catch per unit of gear has not declined. They feel that exploitation has not harmed the resource. They say many countries on both sides of the Atlantic set production records after all this supposedly harmful fishing took place. Denmark expressed willingness to regulate the fishery whenever overfishing is proved.

Eastern Pacific Tuna Catch Reported by IATTC

The total tuna catch in the convention zone, Jan. 1-Oct. 28, 1968, was 109,586 short tons of yellowfin and 64,512 short tons of skipjack, reports the Inter-American Tropical Tuna Commission (IATTC).

The annual bait-boat catch rate of 4.70 tons of yellowfin and skipjack per day was the lowest in 5 years. The catch rate by purse seiners on nonregulated trips remained high; the yellowfin rate, at 8.55 tons per day, was the highest in 5 years.

The skipjack catch rate of 3.24 tons per day was lower than 1967 but higher than 1964-1966. Purse seiners on regulated trips--after yellowfin quota had been reached--caught a daily average of 4.7 tons of skipjack and 0.74 ton of yellowfin.

Oil Pollution International Conference Held

A global pact to control the growing menace of all forms of marine pollution, including oil, dumping of pesticides, and radioactive wastes, industrial discharges of toxic chemicals, and normal sewage discharge has been urged by Roy Jackson, FAO's Assistant Director General. He spoke at the Third International Conference on Oil Pollution of the Sea in Rome, Italy, Oct. 7, 1968.

He said international legislation must forestall not only "accidental" pollution, as in the Torrey Canyon disaster, but all types, including release of "potential pollutants" and "deliberate use of ships to discharge pollutants into seas and coastal areas."

Calls for International Convention

He said it was time to consider a convention to report discharges, and to control, restrict, or prohibit deliberate discharging of specified noxious substances.

Such a pact, Jackson added, should provide for a permanent commission to monitor, enforce, and to identify "particularly noxious substances" and means to control them.

1958 Geneva Conventions

He noted that the United Nations Geneva Conventions of 1958 on the law of the sea cite pollution but do not provide for reporting or control. The oil pollution convention of the Inter-governmental Maritime Consultative Organization does not provide proper standards for pollution control.

FAO will call an International Conference in 1970 to discuss the effects of pollution on fishing.

Conference on Fish Meal

The 8th Annual Conference of the International Association of Fish Meal Manufactures (IAFMM) in Bremen, West Germany, Sept. 30-Oct. 4, 1968, was attended by fish meal industry representatives from 18 countries. They heard the latest information on current and potential production, consumption trends, and activities to aid marketing.

In the keynote speech, Dr. Gerhard Meseck, West German Ministry of Food, Agriculture, and Forestry, said his studies showed that the world's fish meal production could be raised to 7 to 8 million metric tons before the year 2000. Current problems of unbalanced supply and demand were attributed to the main producers' lack of market experience. The needs for business stability, and for a effective catch utilization in such products as fish protein concentrate for human consumption, were emphasized.

Variety of Specialists

Brokers and importers discussed quality and market problems. Scientists and nutritionists exchanged information on ways to process and market a high-quality product. Future prospects for production and marketing were outlined.

IAFMM members are Belgium, Canada, Chile, Denmark, France, W. Germany, Iceland, Morocco, the Netherlands, Norway, Peru, Portugal, South Africa, Sweden, the U.K., and the U.S.

The next meeting is scheduled for October 1969. An Executive Council meeting will be held in Madrid immediately after. The Scientific Committee meets in Amsterdam, April 9-10, 1969.

△△△△△△△△△

Japan & Australia Agree on Fishing Inside 12-Mile Zone

Negotiations on Japanese fishing in Australia's 12-mile zone were concluded in mid-September 1968. The agreement, to take effect in spring 1969, covers a 7-year period (3 years for coastal areas of Papua and New Guinea, which become independent in 1971).

Japanese tuna vessels will be permitted in traditionally fished areas in the 12-mile zone, except in waters between Sydney and Brisbane, and a section off Tasmania's west coast. Fishing effort will be permitted at the present level of about 6,000 tons a year. Four ports will be open to Japanese vessels. Each vessel will be assessed about US$100 annually. ("Suisan Tsushin," Sept. 21, 1968.)

USSR Seizes Japanese Vessels

On Sept. 28, 1968, the USSR seized 2 Japanese fishing vessels with 17 crewmen near Etorofu (Iturup) Island in the southern Kurils. When the Japanese protested the seizures and inquired about the crewmen, the Soviet Foreign Office gave them a list showing 16 crewmen and denied that one had been injured during the incident. After Japan asked about the 17th man, the Soviets admitted they were holding 17.

In another incident, the USSR notified Japan on Oct. 12 that she would release 10 fishermen seized off Shikotan Island in late August 1968. What happened to their 2 vessels is not known.

Japan-USSR Meet to Assess Pacific Saury Stocks

In September 1968, biologists from Japan and the USSR held a 5-day study meeting aboard the Soviet factoryship 'Pavel Chebotnyagin' anchored off Japan. They discussed saury stocks and migration and agreed that saury abundance in coastal waters has declined.

Japan believes there are two groups of saury, one spawning in spring and the other in fall; Soviet biologists believe there is only one.

The next study meeting may be held in Japan. ("Shin Suisan Shimbun," Sept. 30, 1968.)

Japanese Explore for Tuna Off Chile

The 340-gross-ton long-liner 'Azuma Maru No. 31,' exploring for tuna off Chile, completed her second cruise in mid-September 1968 and called at Valparaiso to reprovision. Now on her third trip, she is seeking southern bluefin in the area bounded by 35°-45° S. latitudes and 80°-85° W. longitudes and has already taken four (total weight 792 lbs.).

In the first 2 surveys, good big-eyed tuna catches were made in the upper latitudes. Fishing by several long-liners has begun in that area. Azuma Maru's catch, late May to early October: 155 tons of tuna; big-eyed 106.9 tons, or 69%; albacore 23.3 tons, or 15%; and others, including six bluefin, 24.8 tons, or 16%.

South Koreans and Japanese Agree to Study Problems

A ministerial conference between South Korea and Japan was held in Seoul in late August 1968. The ministers agreed to establish an Agricultural and Fishery Technical Cooperation Committee to study technical exchange problems and to exchange fishery specialists.

South Korea wants Japan to liberalize fishery imports from Korea. The Japanese agreed to study the problem because of Korea's need to expand her fishery exports. Both nations are pleased with the surveys for development of fish-culture projects on and off the Korean coast, and the plans to develop shallow sea areas and tidal flats.

U.S.-USSR Groundfish Survey Conducted Off Mid-Atlantic Coast

In mid-November 1968, the Soviet research vessel 'Blesk' and BCF's 'Albatross IV' completed the first joint survey made under the Mid-Atlantic Fisheries Agreement from Cape Cod, Mass., to Cape Hatteras, N. C. The survey's purposes were to determine autumn distribution and relative abundance of groundfish, and to evaluate relative efficiencies of each country's standard survey trawls.

Blesk's Second Survey

The Blesk then was scheduled to study stocks and distribution of red and silver hake on Georges Bank and Nantucket Shoals and to return to Kalingrad on Dec. 18, 1968.

In late September 1968, Canada's research vessel 'Theta' joined the U.S. and Soviet vessels for a plankton survey in ICNAF subarea 5.

U.S.-Japan Fisheries Conference

On Nov. 13, 1968, in Washington, D. C., U.S. and Japanese officials began a review of 2 fishery agreements. The first agreement, signed in 1964, regulates king crab fisheries in the eastern Bering Sea. The other, signed in 1967, concerns fishery problems off the U.S. coast.

The 2 delegations examined operation of the agreements in the light of current problems and developments in the fisheries.

The U.S. delegation, including representatives from Alaska, Washington, Oregon, and California, was led by Ambassador Donald L. McKernan, Special Assistant to the Secretary of State. The Japanese delegation was headed by Minister Bunroku Yoshino of the Japanese Embassy.

U.S.-USSR Scientific Meeting

BCF scientists and representatives from Washington, Oregon, and Alaska met with Soviet scientists in Moscow in October 1968. They exchanged information on research on northeastern Pacific groundfish stocks--Pacific ocean perch, hake, and shrimp--and planned a coordinated research program. The meeting was held under the U.S.-USSR Feb. 1967 agreement on fishing in the northeastern Pacific off the U.S. coast.

Norwegian Canning Plant Slated for Shetlands

The Shetland County Council has agreed to back financially a Norwegian fish cannery on the Island of Yell. The decision sparked a major row over foreign interests getting preference over local and British companies. Norwegians have proposed a canning plant; local groups offered a freezing plant. Council felt a cannery would add more to the industry. The local company, Shetland Seafood's, still may proceed with its plans. Either proposal would provide possible employment for 30-40 people.

Much interest has been shown in developing the shellfish trade, particularly crab and lobster. ("Fishing News," Sept. 1968.)

Conference on Oceanology to be Held in U.K.

Oceanology '69, the first international conference and exhibition on oceanology in western Europe, will be held at Brighton, England, Feb. 17-21, 1969. A major international conference on ocean science and engineering will be held concurrently with the exhibition.

The National Council on Marine Resources and Engineering Development will direct U.S. participation in the conference. Plans have been made by a working committee of representatives from agencies having substantial interest in oceanology. Papers will be presented by leading U.S. oceanographers and government officials, including a U.S. Senator.

U.S. Exhibit Large

The U.K., Canada, Japan, France, Germany, and the Soviet Union are planning exhibits. Over 30 American firms prominent in oceanology will offer the following products and services of particular interest to the fishing industry: fish protein concentrate plants; research submarines; submersible motors; equipment; oceanographic and cargo winches; undersea habitats; and acoustic equipment.

FOREIGN

CANADA

WORLD'S LARGEST SALMON-REARING STATION OPENS

The world's largest Atlantic salmon rearing station was opened in October 1968. The C$3.5-million Mactaquac fish culture station, on the St. John River just below the site of the Mactaquac hydroelectric development, is the first of its type in North America.

Construction of a 600,000 kw. power dam will interfere with Atlantic salmon migration both ways on the St. John. The station will raise enough Atlantic salmon to perpetuate the runs. Total salmon run in the St. John has been estimated at 10,000 to 20,000. The fish will be trapped in collection facilities at the dam site, about 1,000 kept as brood stock, and the rest transferred by specially designed tank trucks to the waters above the dam to support angling and natural reproduction on the upper St. John. The station will also support a commercial salmon fishery in the lower regions of the river and in the Bay of Fundy.

Production Has Begun

Mactaquac began producing on a trial basis last fall. Hundreds of thousands of tiny salmon, which emerged from the egg stage last January, have been raised to the smolt or sea-going stage. They will start their downstream run soon. This is only the start of a large operation designed to produce 500,000 young salmon. (Canadian Dept. of Fisheries.)

* * *

NEW RULES SET FOR B.C. SALMON FISHING

New regulations increasing the earning power of British Columbia salmon fishermen and permitting more effective management of the salmon resource will be effected in 1969. The size of the fishing fleet will be limited, which should reduce production costs. Vessels presently fishing for salmon will not be deprived of fishing rights. Anyone will still be able to buy and sell salmon vessels.

The new regulations place vessels in two categories, based on commercial landings either in 1967, or in this year up to Sept. 6. In both categories, transfer of vessel ownership will be allowed; and the salmon fishing license will accompany the vessel.

Vessels in the first category are those with a 10,000 pound or more production of pink or chum salmon or the equivalent in other species, based on the following formula: 1 lb. of sockeye or coho equals 3 lbs. of pinks or chums; 1 lb. of spring salmon equals 4 lbs. of pinks or chums. This would be equivalent to about C$1,250 landed value.

Licenses for "A" category vessels will be renewable annually. If a vessel is to be newly licensed, it must replace an A category vessel.

The "B" category includes vessels producing less than 10,000 lbs. of pink or chum salmon or the equivalent. They may renew licenses annually, but they cannot be replaced by a new vessel. Most vessels in this category are small and, in terms of commercial catch, they provide about 1% of total salmon production value.

Vessels licensed for salmon in 1967 or 1968 that did not record any commercial landings in 1967, or prior to September 6 in 1968, will not be licensed in 1969.

The salmon license of a vessel removed from the fishery by loss at sea will be cancelled and cannot be replaced.

To increase the value of the salmon fishing privilege, the license fee will be increased from C$5 to $10 in 1969. As the fishing privilege becomes more valuable because of fleet size reduction, license fees will be further increased. Current cost to salmon fishermen is $20--commercial fishing vessels registration, $10; validation for salmon fishing, $5; personal fishing license, $5.

The new measures supplement the conservation and research programs that are ensuring a continuing and increasing supply of salmon. (Fisheries News, Dept. of Fisheries of Canada, Vancouver.)

* * *

Canada (Contd.):

TUNA CATCH IS UP

Tuna landings through September 1968 were 1,952,000 pounds; in the 1967 period, 122,000 pounds. Development of this industry has been difficult. Several disputes have occurred over labor matters and government policies.

In September, tuna were selling for C$350 a short ton in Vancouver. ("British Columbia Fish Marketing Report.")

* * *

1968 MAY PROVE GOOD FISHING YEAR FOR ONTARIO

Production in first-half 1968 indicated a good year for Ontario commercial fishing: 22.5 million lbs. of fish yielded a gross return of C$2.3 million. By the end of June, landings were 3 million pounds more and C$89,000 above landings at mid-1967.

Species

Landings increased in all Great Lakes waters except Lake Huron proper. There were increases in 19 of the 25 species comprising the catch; these included the premium whitefish, walleye, lake trout, and sturgeon. Smelt landings showed the greatest change, increasing from 4.6 to 7.5 million lbs. Yellow perch was 7.8 million lbs., and walleye 1 million.

Lake Erie Perch

An 8% decline in the perch harvest from Lake Erie was due to new controls imposed to solve the problem of oversupply. A slight price decline, coincident with smaller landings, depressed the value of the perch catch for first-half 1968 by 11% from 1967.

Perch are abundant in Lake Erie and fishermen were not expected to have difficulty taking the quota for the second half. (Ontario Dept. of Lands and Forests.)

* * *

EXPLORATORY FISHING IN LAKE ONTARIO

A 5-month program to determine if smelt and alewife stocks in Lake Ontario will support a commercial trawl fishery was completed in December 1968. The program investigated markets for the species and delineated grounds over which bottom trawling is physically feasible.

Methods & Results

Canadian waters of the lake were subdivided into sampling areas of about 50 sq. miles. These were searched with a fish-detection echo sounder. Radar was used to maintain the vessel on the search pattern's predetermined courses. Trawl tows were made where sizable schools were found to determine their sizes and species. A biologist was aboard to direct operations and to record and interpret results.

Findings suggest that the lake's eastern basin has the greatest concentrations of alewives and smelt. (Ontario Dept. of Lands and Forests.)

* * *

MIDYEAR REPORT ON MARINE OILS & FISH MEAL

Marine oil production during first-half 1968 was 27.5 million pounds, 16% more than the 23.7 million produced in the 1967 period. Most of it was herring oil, the rest small quantities of seal, whale, and other marine oils. The greater part of herring oil is used to manufacture margarine; the remainder is used for shortening oil.

Marine Oil Exports & Imports

Marine oil exports declined 61.3% during the first 7 months; imports dropped 65.1%. As a result, Canada has a favorable trade balance of 975,000 pounds, compared with a favorable balance of 1.8 million for the same period in 1967.

Fish Meal Production

Fish meal production during first half was 94.8 million pounds, 21.5% more than the 78 million of first-half 1967. Total 1967 fish-meal production was about 196 million pounds.

Fish Meal Exports & Imports

From Jan.-July 1968, fish-meal exports increased 38.7% to 19.2 million pounds. The U.S. bought 63.8%, compared with 28.3% for the first 7 months of 1967. Imports during the same period were 2.6 million pounds;

Canada (Contd.):

none was imported in 1967. (Foreign Agricultural Service, Ottawa, Canada.)

* * *

TESTS MIDWATER TRAWLING

Midwater trawl operations using a stern ramp vessel are being sponsored jointly by federal and provincial governments and industry.

In mid-September 1968, a 156-ft. stern ramp trawler, the "J. B. Nickerson," landed a record 427 short tons of herring at Pubnico, Nova Scotia. She made the catch in 30 hours and 12 tows on Orphan Bank in the Gulf of St. Lawrence. From Aug. 19 to Sept. 12, the vessel landed 1,652 tons of herring, amply demonstrating the method's economic potential for stern trawlers.

Large quantities of herring are taken by purse seiners operating over huge schools of fish. Midwater trawling is performed during daytime, when herring are dispersed and too deep for successful purse seining. (Canadian Dept. of Fisheries.)

* * *

ACCEPTS NEW ICNAF REGULATIONS

Canada has accepted changes in regulations governing fisheries in the northwest Atlantic. She and the 13 other members of the International Commission for the Northwest Atlantic Fisheries (ICNAF) are concerned about the effects of heavy fishing on the fish stocks.

The new regulations will include additional species of fish under conservation measures establishing minimum mesh sizes for the nets used. Cod and haddock have been regulated for years. The minimum mesh sizes, ranging from $4\frac{1}{2}$ to 5 inches, depend on the area being fished and the type of gear used and are designed to permit the escapement of fish under commercial size.

Flounders, Halibuts, Redfish

Flounder will be regulated in all ICNAF fishing areas northeast of, but not including, Georges Bank off New England to the coast of Labrador, in the minimum mesh-size regulations. In the Grand Banks area which extends westward and southward more than 600 miles, halibut and Greenland halibut are included in the regulations. In the northern section of the Grand Banks, redfish come within the minimum mesh-size restrictions.

Nations Police Their Nationals

To administer the 200,000 square miles of ICNAF waters, there are 5 subareas. The present control system makes each nation responsible for enforcing ICNAF regulations for its own nationals. Canada, for instance, sends patrol vessels to the fishing banks with authority to board Canadian fishing craft. At the landing docks, officers of the federal Department of Fisheries Conservation and Protection Service board Canadian fishing vessels to check mesh sizes.

14 ICNAF Member Nations

Canada was an original signer of the international convention set up almost 20 years ago. There are now 14 member nations: Canada, Denmark, Germany (Federal Republic), Iceland, Italy, Norway, Portugal, Poland, Romania, Spain, the U. K., the U.S., and the USSR.

* * *

DISCONTINUES FISHING GEAR INSURANCE

Canada's experimental low-cost federal insurance, covering fixed fishing gear such as weirs, fish traps, working and storage buildings (and the equipment stored in them), has been discontinued. Losses were greater than expected. The plan ran at a deficit because not enough fishermen participated.

During 1967-68, fishermen, mostly in Newfoundland and Nova Scotia, purchased 350 policies with an insured value of C$718,295. In the same period, claims amounted to $26,313, and premiums only $7,089.

Existing policies will be honored but not renewed.

EUROPE

Norway

CATCH DROPS 18%

Norway's catch from Jan.-June 1968 was 1.4 million tons, down 18% percent from the 1.7 million landed in the 1967 period. The decline was due to lower landings of herring, mackerel, and saithe. Capelin catches increased about 20%. Most of the catch--78% percent--was used for reduction. ("Fiskets Gang.")

* * *

WHALING INDUSTRY FADES AWAY

Kosmos--the only Norwegian company that whaled in the Antarctic in 1967--called it quits in 1968. It marked the end of an industry which brought prosperity to the whaling center of Sandefjord, south of Oslo.

High costs, worn-out facilities, and poor markets were major reasons for the decision. The firm would have needed a US$4 million investment to meet competition from other countries, primarily Japan.

A company spokesman stated: "With the development that whaling in the Antarctic has undergone. . .limited catching periods and greatly reduced stocks. . .it would be indefensible to rebuild the large Norwegian whaling fleet." (U.S. Embassy, Copenhagen.)

* * *

STOCKFISH SUBSIDIES

In September 1968, the Norwegian government proposed a US$8.4 million support for the stockfish industry. About half was to be used for state purchases of 5,000 metric tons of unsold stockfish from 1967 production, and the other half for interest-free loans to purchase 1968 production. Norway probably will offer the fish to the World Food Program and/or other humanitarian programs. She did this with the 4,000 tons purchased in spring 1968.

This appropriation is in addition to the US$16.8 million extraordinary support measures for the stockfish industry adopted during the past 12 months. The degree of state support extended to the stockfish industry is illustrated by the fact that the total export value in 1966, the last normal year, was US$21.8 million. Very little stockfish is sold for domestic consumption.

Marketing Conditions Abroad

Increasing competition and general deterioration of marketing conditions abroad for some of Norway's major fish products gained further momentum in 1968. The civil war in Nigeria, Norway's most important market, reduced deliveries to a fraction of normal levels; and Mexico banned klipfish imports. Prices abroad declined for several major fish products--frozen fish fillets, shrimp, and marine oils. Export statistics for first-half 1968 showed reduction in quantities and values of 3.6% and 19%, respectively, to 390,000 metric tons and $99 million, compared with the 1967 period.

Domestic Repercussions

The poor overseas market conditions, temporary stoppages of fishing for certain species in various districts, reduced incomes and profits and caused several bankruptcies among processors/exporters. The Fishermen's Union, several local unions, and fishermen's marketing organizations blamed the exporters for failing to exploit marketing opportunities, and for the price-depressing competition overseas. They all recommended that full centralization of fish exports be enforced under the 1955 Law on Fish Exports.

Conditions in Finnmark

The province of Finmark, in the far north, was particularly affected by marketing disruptions; its economy is almost completely geared to fishing. The province is the principal producer of so-called "African quality" stockfish, so the reduced deliveries to Nigeria aggravated her problems. Finnmark's crisis may be largely local, rather than coastwide. The communities particularly affected were the smaller ones, where landings are used for dried and salted products--stockfish and klipfish. The stockfish industry cut purchases of raw fish to 11,300 tons, about one-third the 1967 level, and the klipfish industry by 39% to 4,300 tons from Jan.-mid-Sept. 1968. The small size of most boats from

Norway (Contd.):

the smaller villages prevented fishermen from delivering catches to ports where there was still a market.

The picture was quite different in communities with frozen-fish filleting and reduction facilities, although 1968 prices both for fishermen and in export markets were lower than in 1967. Finnmark frozen-fish filleting plants bought a record 61,200 tons from Jan. through mid-Sept. 1968, 44% more than in the 1967 period. Fish used for filleting results in products bringing much higher prices per unit of raw fish used than fish processed into stockfish and klipfish. Deliveries to Finnmark's reduction industry have set a record in 1968. Capelin catches reached more than 520,000 tons, and 318,000 tons of fat herring had been landed by mid-September. This means that Finnmark's fish meal and oil industry must have been working at full capacity since early spring.

* * *

EXPORTS FISH PROTEIN CONCENTRATE

Norway has shipped her first fish protein concentrate (FPC) for human consumption. The shipment, from Skude Fishkemelfabrikk near Haugesund, was 3 metric tons of fish meal (probably herring or mackerel meal) packed in 25-kg. paper sacks to be marketed in Cameroun.

There is some reason to believe that Skude Fishkemelfabrikk FPC is based on conventional gasoline extraction of fat using fresh fish raw material.

* * *

MANY DOGFISH CAUGHT ON GEORGES BANK

The 'Arnfrid Leonora' returned to Bergen, Norway, in November 1968 with a 75-80-ton catch of dogfish taken on Georges Bank off the Massachusetts coast. The vessel, at sea for two months, found good stocks of "large, fine dogfish of the best quality" on the Bank. Fishing was most effective at 10 to 30 fathoms. She was the only vessel seeking dogfish, although large numbers of foreign vessels were fishing on the grounds.

Sales on European Market

Dogfish are taken on longlines fished near the bottom, and as incidental catch in bottom trawling. Norway takes about two-thirds of Europe's 30-40 thousand ton annual catch; U. K. takes most of the remainder. Fresh dogfish and smoked pieces of back and belly flesh go primarily to Germany and the U. K.

In Germany, the flesh is smoked and packed in gelatin as a semipreserved product, canned in oil, or sold as "seeaal" (ocean eel) and "schillerlocken."

In Denmark, fresh, skinned dogfish is sold as "kongeal" (king eel). Properly prepared, dogfish have a fine, delicate flavor.

U.S. Opportunities

U.S. fishermen might be able to sell the countless tons of dogfish they take as incidental catch. The market on the Continent was excellent, but heavy British landings were limiting sales possibilities there.

Denmark

RECORD YEAR IS LIKELY FOR FISHING INDUSTRY

It is likely that fisheries will set a record in 1968. Fishermen received 50 million kroner (US$6.7 million) more during the first half than in the same period of 1967. A record year was also expected for exports. If good weather held, they would exceed one billion kroner ($133 million), an increase attributable to excellent weather and heavy landings of industrial species.

* * *

MORE SUBSIDIES RECOMMENDED IN GREENLAND

The fisheries, Greenland's major industry, are in trouble and local legislators say further subsidization is the only solution.

Cod usually provides about two-thirds of Greenland's landings; the catch for the first 7 months of 1968 was down about 35%. The

Denmark (Contd.):

catch failed catastrophically in the major ports; in Holsteinboborg, the hardest hit, it dropped more than 80% from 1967. Many fishermen fear they will be unable to meet payments and lose their vessels. Catches of seal also dropped.

* * *

NORWAY DELIVERS VESSELS TO THE FAROES

Norwegian yards delivered 2 fishing vessels, a shelter-deck long-liner and a power-block purse seiner, to Faroese owners in September 1968.

The long-liner, 'Leivur Hepni,' is 160 ft. long, has a 1,200-hp. diesel main engine, and can cruise at 13.3 knots. The covered and heated work deck makes it easier for the 27-man crew to work distant grounds off Greenland and Newfoundland.

Another Faroese long-liner, the 'Isborg,' is being equipped with refrigerated seawater (RSW) tanks in Norway. The vessel will be used to supply the European market with fresh herring. She is 196 ft. long and has a covered and heated work deck.

The Purse Seiner

The purse seiner, "Solborg," is 138 ft. long and has a 1,200-hp., 4-cycle, V-type diesel main engine directly coupled to a variable-pitch propeller. She has 2 side-thruster propellers, a pair of 63 kw. motor generators for auxiliary power, and comfortable cabins for the 17-man crew. She is equipped with the most modern hydraulic deck gear, and electronic navigating and fish-finding equipment and dual sonar and radar. She also has 2 RSW tanks subdivided into 3 tanks each. The smaller sections can be used separately, or they can be connected by open hatches to simplify loading when catch is landed for industrial purposes. Solborg will catch herring for British and Continental fresh-fish markets.

Fresh Herring Not Fish Meal

The low prices Faroese fish-meal plants were paying for raw material spurred the interest in RSW-tanked purse seiners. RSW tanks make it possible to deliver herring suitable for human consumption to a number of North Sea ports, especially in Denmark, Germany, and Scotland. The conversion of big Faroese long-liners to power-block seining for industrial-quality herring may shortly be followed by conversion to fishing for food-quality herring using RSW tanks. Norway and Denmark also are interested in RSW-preserved herring, a development welcomed by those who consider herring too good for fish meal.

* * *

LAUNCHES FIRST FLOATING FISH-MEAL PLANT

A 30-year-old Danish patrol and rescue vessel--renamed 'Helsing'--has been converted to a fish-meal factoryship capable of processing about 75 tons of fish every 24 hours. The owners have invested US$266,000 to produce high-quality fish meal for mink feed. Because this requires first-quality raw material, they are "taking the factory out to the fishing grounds."

The fish-meal plant is a fully automatic 'compact' model produced by Dan-Thor.

Spain

WINS 7TH PLACE IN WORLD CATCH

Fish production in Spain continued upward in 1967 and won her seventh place worldwide in volume of production, and fifth in value. The official fish catch was 1,428,780 metric tons, with a first-sale value of US$330.9 million. This was an increase of slightly more than 4% over 1966's 1,371,000 tons. The high value is explained by the relatively high percentage (16%) of shellfish in the total catch.

Fleet Grows

In 1961, Spain enacted the Law for the Renovation of the Fishing Fleet. From 1961 through March 1967, fleet tonnage increased from 270,000 to 484,000 gross registered tons. Credits for fishing vessels granted exceeded US$100 million.

This trend is continuing. During 1967, 288 new fishing boats entered service.

Spain (Contd.):

As of March 1968, 140 fishing vessels were on order in Spanish yards (most over 100 tons and steel-hulled), including 79 long-range, 31 freezers, and 30 cod vessels. The improvement has been concentrated in the long-range fleet, while the coastal fleet has deteriorated. Official efforts are underway to reverse this deterioration but are handicapped apparently by lack of sufficient official credit.

Long-Range Fleet

The shift to the long-range fleet has meant a shift in type of species landed, with important consequences for the domestic market. Offshore fish important to the packing industry, such as anchovies and tuna, have been declining, while frozen fish and cod from the long-range fleet increase.

Demand for frozen fish does not match increasing supply. The problems are consumer preferences and insufficiency of refrigerated storage facilities. The Ministry of Commerce is actively promoting the Refrigeration Expansion Plan for medium-sized warehouse and at retail level.

Per-Capita Consumption Up

Per-capita fish consumption increased from 38 lbs. in 1964 to 44 lbs. in 1967. Expansion of refrigeration facilities will tend to even out extreme differences in consumption rates between provinces. (U.S. Embassy, Madrid, Sept. 25, 1968.)

* * *

FACES PROCESSING TROUBLES

Processed fish reached a record value of slightly over US$100 million in 1966, but it remained the only sector of the fishing industry that fell far short of planned goals. This was due mainly to failure to modernize and consolidate small and inefficient plants, and to insufficient supplies of the fish most in demand. During the last 2 years, landings for processing have declined, in absolute and relative terms.

* * *

WEST AFRICAN FLEET IS REDUCED

White fish catches by Spanish trawlers off the coast of South-West Africa had dropped by Sept. 1968 from about 30 tons per-day per-vessel to 10. Seasonal scarcity of white fish, especially hake, caused the reduction.

Off South America

Fifteen Spanish vessels were fishing off Argentina, Chile, and Peru. Catches were reported good, although the fish were smaller than those in South-West Africa catches.

Markets

Meanwhile, the fish glut on the Spanish market had ended. Some frozen fish was sold to the U. K. and marketing prospects in Japan were being investigated.

Transshipments

The bigger trawlers off the South-West African coast returned to Spain after filling their holds, instead of transshipping to reefers. Only the smaller ones were transshipping at Walvis Bay. ("South African Shipping News and Fishing Industry Review," Sept. 1968.)

USSR

STUDIES COMMERCIAL DEEP-WATER TRAWLING

The 'Akademik Berg' of the Pacific Fisheries and Oceanographic Research Institute has been in the northeast Pacific since mid-August 1968 investigating pelagic fishery resources between 900 and 6,000 ft. (300-2,000 m.) and trawling to 6,000 ft. (2,000 m.). Earlier explorations indicated commercial concentrations of fish at these depths. In the Barents Sea, the Murmansk trawler fleet was reported trawling on a commercial scale as deep as 2,700 ft. (900 m.).

In the North Atlantic

In 1961, the Soviets began deep-sea fishing on Georges Bank and in the Norwegian Sea at 1,800-2,100 ft. (600-700 m.). In 1965,

USSR (Contd.):

the Latvian fleet made good catches while deep-water trawling off the Grand Banks; in 1966, Kaliningrad vessels also tried deep-water trawling there.

In 1968, in the North Atlantic, researchers aboard the 'Aisberg,' 'Okeanograf,' and 'Professor Vize' have been studying the dynamics and thermics of water masses to 3,000 ft. (1,000 m.). The Polar Fisheries and Oceanographic Research Institute, using data gathered during 3 years of hydrobathygraphic research, is preparing a map of North Atlantic deep-water regions having commercial concentrations of fish.

North Pacific and Bering Sea

In 1962, the exploratory research vessel 'Adler' trawled at 600-2,100 ft. (200-700 m.) for halibut, ocean perch, and sole in the Bering Sea, off the Aleutians; she caught 2.5 metric tons of halibut and 8 tons of perch in 1 hour. In 1963, catches by 'Ogon' at 1,200-2,100 ft. (400-700 m.) in the Bering Sea occasionally exceeded catch in shallower waters. Later that year, 3 large stern trawlers began commercial deep-water trawling in the North Pacific and the Bering Sea. In 1964, 'Akademik Berg,' trawling in the Bering Sea at 3,000 ft. (1,000 m.), reportedly caught 50 tons per fishing day; in 1966, she was back again, trawling at 1,200-4,500 ft. (400-1,500 m.) for halibut and sable fish.

Barents Sea

In 1964, the exploratory trawler 'Treska' found commercial concentrations of turbot at 2,850 ft. (950 m.) near Bear Island in the Barents.

Kuril Trench

In 1966, 'Vitiaz' explored the Kuril Trench and collected data on the fauna and biology to 27,000 ft. (9,000 m.). She reported large catches of fish to 10,500 ft. (3,500 m.).

Technical Problems

The Soviets can fish to about 2,700 ft. (900 m.), but they cannot fish much lower. Although all surveys since 1963 have indicated fish concentrations at lower depths, the problems caused by enormous pressure on the gear at lower depths are staggering.

* * *

SHRIMP RESEARCH IN THE PERSIAN GULF

Kuwaiti shrimp fishermen in the Persian Gulf, using small vessels with double trawling gear, land 30-61 metric tons of shrimp tails per month per vessel. A try net is used to locate good areas. The average daily shrimp catch of a Soviet SRTM is 0.693 ton; the Kuwaiti vessel's is 0.669. This has prompted the Soviets to study shrimp biology and fishing techniques to find improved trawling methods.

Weather Conditions

The best Soviet hourly trawling catches, 0.3-0.4 ton, were obtained during westerly winds and the first 3 or 4 days of calm thereafter. Then, the shrimp moved into shallower waters, where they could not be fished. These observations were not double-checked in 1966/67 when southeasterlies prevailed.

Tidal Conditions

Tides and moon phases also affect catch size. In 1966/67, shrimp catches were highest during full moon and new moon periods, except in late December and early January, when molting shrimp prevailed. Daily catches also increased during the tide change.

Effect of Black Croakers

Black croakers, 'Sciaena,' cause shrimp to move away. During 1 hour, in 1966, a processing trawler caught 0.2-0.25 ton of shrimp; several days later, after sighting many black croakers in the area, catch per hour dropped to only 100 shrimp. Examination of 'Sciaena' stomachs revealed they had fed exclusively on shrimp.

Temperature Variations

Temperature variations can affect shrimp catches. The best catches occurred at bottom temperatures between 24 and 26° C. (75.2-78.8° F.) in December, and 23° C. (73.4° F.) in January. No shrimp were caught at temperatures below 20° C. (68.0° F.).

Results

The Soviets have decided that shrimp fishing in the Persian Gulf should be done with small vessels equipped with double trawls and a try net. Shrimp vessels should deliver catches to floating bases, like BMRTs, with

USSR (Contd.):

fish-meal producing facilities. Fish caught incidentally to shrimp fishing could be processed into meal. Trawling should be done during a full moon or new moon, during the daily change of the tide, with westerlies, and during the 3 or 4 days of calm that follow. Shrimp fleets should include an exploratory vessel to discover new commercial concentrations, to direct the fleet to them, and to make hydrometeorological observations. ("Rybnoe Khoziaistvo," No. 7, 1968.)

* * *

FISHES MACKEREL OFF JAPAN

Soviet fishing for mackerel off eastern Hokkaido is expanding. In Sept. 1968, 33 fishing vessels, 4 factory motherships, and 1 refrigerated transport were sighted around 43° N., 147° E., catching and canning mackerel. The Soviets use purse seines on converted medium side trawlers. One source reported as many as 100 vessels divided into 6 fleets.

In 1967, 6 medium side trawlers and 4 seiners caught 9,000 metric tons in 2 months off the South Kurils and Hokkaido.

At last report, the Soviets were investigating sonar tracking of mackerel schools and the use of lights for night fishing.

* * *

AIDS DEVELOPING COUNTRIES

In early 1968, the Soviet Union was helping 18 countries to develop marine fisheries--Burma, Iran, Uganda, Guinea, Somalia, Kenya, Cameroon, Cuba, the United Arab Republic, and others. There were 450 foreign fishery students in the USSR at that time: in university and technical institute postgraduate programs, training with fishery firms, and on board fishing vessels.

In 1966-67, about 150 foreign students graduated from Soviet fishery schools. Several years before, Kaliningrad fishery firms had trained 200 Cuban students. In 1967, the Soviets hosted 3 FAO Fishery Seminars. One was held aboard a large research vessel and gave participants practical and theoretical experience.

United Kingdom

DEVELOPS ON-BOARD GUTTING MACHINE

The White Fish Authority has developed a gutting machine for use on deck. It works well on cod, haddock, and whiting, cleanly gutting over 80% of the fish without damaging the fillet.

The machine is 44" x 30" x 36" high and weighs 860 lbs. and can be operated electrically or hydraulically. One worker can feed thirty to forty-five $10\frac{1}{2}$-inch fish a minute. The throat is cut if the fish is to be frozen--but it is not if fish is to be landed fresh. The head is left on and the liver is removed with the guts. ("The Irish Skipper," Sept. 1968.)

* * *

NEW FISHERIES POLICY PROPOSED

The U. K. proposed a 5-year export plan for the deep-sea fishing industry with principal benefits going to companies making the most productive use of the resources.

The U. K. recognizes fluctuations in the industry's profitability and the need to preserve efficiency incentives. So a US$4.8 million basic subsidy will be adjusted by reference to operating profits in the preceding year. If these are less than US$9.6 million, the basic subsidy will be increased by half the difference; if more than $9.6 million, the basic subsidy will be reduced by half the excess. The total annual subsidy, limited to US$9.6 million, will not be allowed to rise above a profit-plus-subsidy level of $16.8 million. Subsidy distribution will be related to a vessel's operating efficiency and not to its classification. ("Fisheries Council of Canada Bulletin.")

* * *

GRANTS PRICE GUARANTEE TO SHETLANDS

On Oct. 1, 1968, Shetland fishermen began to receive, for one year, higher minimum guaranteed prices for haddock, whiting, and cod. The Shetland Fishermen's Association members and buyers had agreed on prices".

New minimums (in U.S. measurements): haddock under 14 inches, 4.7¢ a lb.; over 14 inches, 5.8¢ a lb.; cod, unselected, 4.3¢ a lb.; whiting under 13 inches, 4.1¢ a lb., over 13 inches, 5.4¢ a lb. ("Fishing News," Sept. 27, 1968.)

LATIN AMERICA

Mexico

THE FISHERIES OF CAMPECHE

Campeche, the capital city of Campeche state, is one of Mexico's leading fishing ports. It is on the shores of the Bay of Campeche in the southeastern part of the Gulf of Mexico. It lies almost exactly halfway between the other two important fishing towns of the Yucatan Peninsula--Progreso to the northeast, and Ciudad del Carmen to the southwest.

Founded in the 16th Century, Campeche has experienced several economic booms. Over a long period, it was sacked at intervals by pirates. Its old fortifications, colonial churches, and nearby Mayan ruins have attracted some tourists. Agriculture still flourishes in the hinterland, but the city was slipping into deep slumber when development of a shrimp industry injected new life into the old town 20 years ago.

U.S. Demand for Shrimp

As the U.S. demand for frozen shrimp grew, adventuresome American and Mexican operators set up plants and brought boats to the sleepy seaport. Soon local families invested money they had made in hardwood, dyewood, chicle, and agriculture in freezing plants and trawlers. One family is said to own more than 50 shrimp boats. Campeche does not depend as heavily for its existence on shrimp as its neighbor, Ciudad del Carmen--but local people agree that Campeche would be hurt fatally if either the market or the resource disappeared.

Differs from Neighbors

As a fishing port, Campeche differs sharply from its neighbors. Progreso is strictly for fin fish; hook-and-line boats take groupers and snappers. Ciudad del Carmen is strictly a shrimp port. Shrimp is by far the most important species at Campeche, but there is a flourishing fishery for octopus, as well as beach seining for corbina (sea trout) and deep lining for groupers and snappers. Campeche boats fish regularly much farther from home than their neighbors. The name "Campeche" can be seen on the transoms of shrimp trawlers from Texas to Nicaragua. All the freezing plants pack fin fish as well as shrimp.

Campeche's Industry

The Campeche fishing industry is located along 5 miles of beach road between the city and the suburb of Lerma. Five freezing plants, a dozen boatyards, ship chandlers, ice plants, customs dock, fishermen's school, marine laboratory, oil dock, and tank farm combine to create a picturesque and efficient fishery complex.

Campeche's 5 operating freezing plants are, largest first: Booth Fisheries de Mexico, Congeladora del Golfo de Campeche, Congeladora y Empacadora de Mariscos de Campeche, Mariscos del Golfo, and Isla Camaronera. Booth is a subsidiary of a U.S. company. All other plants are owned locally or by residents of Mexico City. Booth is the pioneer plant and Congeladora y Empacadora the newest. The latter is a fine example of the latest in construction and equipment. Some plants have their own unloading docks; others use the customs pier and haul the shrimp to the plant by truck.

The combined rated capacity of the 5 freezing plants is 93,000 pounds of heads-off, shells-on, shrimp per day. Because most of the pack is peeled and deveined shrimp, which is a time-consuming process, actual operating capacity is probably not much over half this figure. A 6th plant is under construction on "Shrimp Row" for a group of local owners. It was scheduled to be placed in operation about the end of 1968 and would add considerable first-class production capacity to the industry.

A fleet of 170 to 200 shrimp trawlers serves the plants. The fleet is supplemented by a small but growing fleet of snapper (huachinangero) and grouper (merero) handline boats, and a host of canoes fishing for octopus and beach seining.

Shrimp Fleet

The shrimp fleet consists entirely of wooden hulled, "Gulf of Mexico" type double-rigged trawlers, most built in Campeche. Although manned by members of fishermen's cooperatives, in accordance with Mexican law, most are owned by private, usually local individuals. Nearly all the boats are powered by U.S.-built diesel engines (mostly Caterpillars). Recently, a West German engine

Mexico (Contd.):

manufacturer contracted to install up to 50 German engines (MWM) by offering a "package" financing proposal. Under this, the purchaser of a new boat could borrow money not only for the engine but for the hull and all equipment. The offer was attractive, and 12 or 15 engines have been installed so far (plus 2 or 3 in Carmen). Some fishermen are pleased, others reportedly have been plagued by breakdowns and lack of parts. Most new boats continue to have U.S. engines installed. The trawl winches, patterned on popular U.S. models, are made by foundries in Merida and Campeche.

The fleet is being upgraded all the time. The vessels fish far from home and owners have learned that large, efficient trawlers are essential. So, many smaller boats are being sold in Carmen, where trawling is in shallower water close to port, and are being replaced by larger craft. The local shipyards are kept busy on replacements and additions to the fleet. Each shipyard is no more than a space on the beach where 1 to 4 boats can be built at a time. On June 21, 1968, no fewer than 41 trawlers were in various stages of construction--from keel laying to outfitting. As each is finished, another is started. It requires about 6 months from keel laying until new trawler is ready to put to sea.

Offshore Fishing

The nearby waters are shallow and non-productive, so the trawlers fish offshore. The best grounds are around the keys--Cayos Arcas and Arrecifes Triangulos, and on the

The fishermen of Patzcuaro Lake, west of Mexico City, operating their unusual fishing gear. (FAO: Patrick Morin)

Mexico (Contd.):

flats a short distance inside these keys. Seasonally, some boats fish the newly developed banks in the Caribbean near Cabo Catoche and Isla Contoy. In all these areas, shrimp trips are 15 to 18 days. Local ice plants supply the vessels.

When fishing is poor around the keys, sometimes in May, June, and July, many Campeche shrimpers fish north of Tampico. They fish about 15 days after the 3-day run to the banks, and deliver the catches to Tampico freezing plants. Then they fish for another 15 days and return with the catches to Campeche. They deliver about half their production at each place. During the last year or so, a few Campeche trawlers have fished off Texas. Others fish for plants in Nicaragua during the local off season.

The Shrimps

Most of the catch is pink shrimp, often up to 90%. Because fishing is in fairly deep water, where larger shrimp are found, the pinks are larger than those taken by shallow-water fishermen at Carmen. A large proportion runs 15-20 to the pound (heads off) and some are under 15. The bulk of the production is peeled and deveined, then individually quick frozen (IQF). The plants are U.S.-made peeler-deveiners. The IQF shrimp are packed in 40-pound-capacity polyethylene bags and placed in cartons (also 40 pounds) for storage and shipment. The IQF are repackaged in the U.S.

The white shrimp and the largest pinks are packed heads off, shells on, in 5-pound boxes. Some plants pack only for export, others also ship to the domestic market, mostly to Mexico City. But some are sent to hotels in Merida and other cities. Most export shipments are made by refrigerated truck and trailer to Brownsville, Texas, a 72-hour trip. Some go by refrigerated ship to Brownsville and Miami. All freezers have sales arrangements with U.S. importers; most freezers sell exclusively to one buyer.

Fin Fish Fillets

Freezing and packaging of fin fish fillets for export are an important and growing part of the shrimp-plant business at Campeche. The principal product is sea trout fillets packed in 5-pound boxes. Groupers and snappers are also processed. The favorite fish locally is the pompano (pampano). It is in good demand in Mexico City, and often appears on the menu at the higher-class seafood restaurants as "pampano de Campeche."

Octopus

Campeche is the site of a flourishing fishery for octopus, a popular seafood in Mexico, particularly in the capital. Most is purchased and shipped by truck to the Government's pilot fishing port at Alvarado, Veracruz, for packaging and freezing. Some is exported to Argentina.

Fishermen's Training School

The Department of Fisheries has recognized Campeche's importance as a fishing center. With the National Consultive Fishery Commission, it has established a Practical Fishermen's Training School and a Marine Biological Station on "Shrimp Row." The school teaches commercial fishing subjects. It operates a standard shrimp trawler with a regular crew, plus students. This vessel fishes exactly like a commercial trawler. It sells its catches to one of the freezing plants, so the students can learn the industry.

The marine station is staffed by 2 full-time biologists, several technicians, and support personnel. Advanced students work part time; visiting scientists, including some from the U.S., are often working on special projects.

U.S. Shrimpers

U.S. shrimp trawlers fishing on the Campeche Banks and around the keys often anchor off the city for a few days of rest during their long trips. About a dozen can nearly always be seen from the city, lashed together in groups as they transfer catches to vessels about to depart for home ports. When storms hit, the U.S. boats take shelter on the calm "flats" in even greater numbers.

* * *

CATCH ROSE IN FIRST-HALF 1968

Mexico's fishery production rose during the first 6 months of 1968: to 125,448 metric tons, 14.6% above the 1967 period.

The catch of shrimp, the most valuable fishery product, and the sixth most valuable

Mexico (Contd.):

export, declined 9.4% from first-half 1967. Exports in Jan.-July were 296.6 metric tons, off 17.8% from 1967 period; exports for first-half 1967 were 33.6% over the 1966 period.

Fish meal production increased 7%, but was still far short of national needs. (U.S. Embassy, Mexico.)

Peru

THE ANCHOVETA FLEET

On July 21, 1968, 1,411 vessels were registered in the Peruvian anchoveta fleet. Processors own 71%, and independent operators 23%. About 60% are 5 years old; 1,178 were built between 1962 and 1966. Six hundred and forty-six are 65 to 69 ft. long; 821 are steel, 590 wood. Seventy-nine percent have power blocks, echo sounders, and fish pumps; engines average about 279 hp. Only 21% of the seine skiffs have engines. Fleet fish-carrying capacity is estimated at 180,406 tons; average vessel capacity is 128.

Callao and Chimbote lead in numbers registered, 363 and 349, respectively. ("Pesca," Sept. 1968.)

* * *

FISHERMEN WIN BENEFITS

In late October 1968, the National Federation of Fishermen (FPP), 18,000 strong, was preparing for a strike when its leaders issued a postponement order. It followed an agreement with the Labor Ministry and industry officials.

Industry will provide medical benefits to fishermen and their families, and construct one or more medical clinics, probably in Chimbote or Callao. The only disagreement was over FPP refusal to accept a 10-sole (US$.26) increase in the price paid fishermen per ton of anchovies over the present 102 soles (US$2.60) granted by the Ministry a week earlier. FPP was asking a 68-sole (US$1.74) increase. Final agreement was expected soon; the new rate should be approximately 115 soles (US$2.95).

Uruguay

GRANTS TUNA CONCESSION TO ITALIAN FIRM

The state fishing monopoly (SOYP) has agreed to permit Finanzaria Brada S.P.A., an Italian firm, to conduct exploratory tuna fishing. The Italians, investing about US$200,000, will send 1 or 2 vessels.

A final agreement will not be signed until the survey is completed in about 8 months. This agreement will require the Italians to form an Uruguayan corporation with 51% Italian capital and up to 49% public and private Uruguayan capital. SOYP will have priority in acquiring shares, and Uruguayan capital must be represented in the firm's directorate.

The Corporation Outline

The corporation will export the tuna as a Uruguayan product; Finanzaria Breda must provide the foreign market. Immediate goals are annual exports of 10,000 metric tons of tuna to Italy, and yearly export earnings of at least $5 million. Finanzaria Breda will commit $13 million--$6,750,000 for fishing vessels and the rest for processing plants. The corporation must reinvest at least 50% of the profits in the Uruguayan fishing industry.

The vessels may fly the Italian flag but, after 5 years, the Uruguayan flag must be flown. Italian crews must be replaced by local crews within 5 years.

Opportunity for SOYP

SOYP has only 5 trawlers and small processing plant, and lacks the capital to exploit coastal waters. Fish has never been a popular food in Uruguay, and SOYP has had few opportunities to expand. The agreement makes it possible to earn money from nontraditional exports. Also, it offers the prospect of large investments in the small fishing industry. (U.S. Embassy, Montevideo.)

ASIA

Japan

INDUSTRY SUFFERS DECLINE

Since second-half 1967, a decline in the fishing industry has been apparent. Though the Tokyo Stock Exchange was active, maintaining a high Dow-Jones index of 1,500 yen, stocks of 4 out of 6 fishing companies were listed below face value.

Never before has the industry had the many domestic & foreign problems of the end-1967 through mid-1968 period. In December 1967, Britain suddenly devalued the pound by 14.3%. The U.S. intensified its defense of the dollar under pressure from Vietnam outlays. As a result, Japanese exports of frozen tuna, pearls, whale oil, and canned salmon have dropped. Exports of marine products will be less than US$300 million in fiscal year 1968. Pelagic trawl-fishery operators have gone into debt because they are being eliminated gradually from rich areas by other countries extending their exclusive fishing zones or territorial waters. Rising costs are making it difficult to fish distant grounds. Quotas for Antarctic whaling, and North Pacific whaling, salmon, and crab continue to decline. The number of active shrimp ventures abroad is so small that maximum annual sales of only one billion yen (US$2.8 million) cannot cover deficits in the salmon and trawl fisheries. Factoryship processing of frozen surimi (mince meat and meal) will contribute something, but companies are suffering rising costs for vessels, fishing equipment, and labor. Shore bases, too, have problems.

Suggestions for Government

The basic position of the Agriculture and Forestry Ministry toward fishing vessels of the large companies must be revised. The Ministry is using the same approval system as was used in the Tokugawa Era (feudal era) and has made few decisions. It was easy to adopt regulations for coastal fisheries because of pressure from the Diet. For example, construction of large fish reefs, which the Ministry has been sponsoring in recent years, will increase fish locally--but will not contribute much to Japan as a whole. Some say they might as well throw money into the sea as contribute to the manufacture of concrete blocks.

Distant-Water Fishing Problems

There is no guidance for pelagic trawl fisheries. They have lost their right to purse seine and trawl fish near Japan; they have been forced to fish in distant waters. Restrictions have been imposed that block distant-water operations. The fishing industry will be badly placed in the future, when compared with foreign vessels. The industry does not want complete freedom, but it does want the present approval system eased. The large companies contribute 50% of Japan's total fish supply, so the government should finance and administer it.

Japanese pelagic trawl and tuna fisheries must pay a fee to fish in Australia's and New Zealand's expanded fishing zones; a similar position may be taken by African and South American countries. The Japanese government could pay half of fee. ("Suisan Keizai.")

* * *

IMPORTERS FORM INSPECTION ASSOCIATION

The Fishery Products Importers Association, whose members imported 70% of all fishery imports in 1967, has established an Inspection Association to handle the growing volume of imported shrimp, fish roe, agar-agar, and other fishery products.

What It Will Do

The new organization will: (1) inspect and certify imported fishery products by Importers Association quality standards; (2) certify conformance with contracts; (3) travel abroad, when requested, to inspect and certify volume purchases; (4) sample entire shipment to assure uniform quality; and (5) perform inspection for nonmembers when possible. ("Suisancho Nippo," Oct. 4, 1968.)

* * *

TRADE MISSION RETURNS FROM ITALY

The government-industry fishery trade mission sent to study Italy's frozen-fish import situation has returned. The group found that Italy, the second biggest buyer of Japanese tuna after the U.S., requires 40,000-45,000

Japan (Contd.):

metric tons (MT) of raw tuna annually for the packing industry. Because Italy's domestic catch is only around 2,000 tons a year, packers depend heavily on imports. During Jan.-June 1968, Italy imported 17,000 tons of raw tuna; Japan supplied 75%. Imports during Jan.-Sept. were 26,000 tons.

Import Duties and Restrictions

Italy probably will not impose more import restrictions on Japanese tuna because the European Common Market may remove quantitative restrictions on fish imports from nonmember countries. At present, Italy admits up to 30,000 MT of frozen tuna duty free; imports from 30,000-45,000 tons are dutiable at the rate of 0.5%, and over 45,000 tons at 23.8%. A price standard of c.i.f. $350 per MT for yellowfin tuna imports was established in July 1968. Yellowfin imported at lower prices is taxed to cover the difference. ("Nihon Suisan Shimbun," Nov. 1, 1968.)

* * *

PROMOTES CARIBBEAN MARKET FOR MARINE ENGINES

To promote export of marine engines to Caribbean countries, the Japan Marine Engine Export Promotion Assoc. will send a team of experts to conduct market studies in January 1969. They will study the market structure, use of foreign equipment, and volume and value of marine engine trade. Since about 3,000 vessels, mostly powered with U.S.-made main engines, fish in the Caribbean, the Association believes there is market for Japanese engines.

* * *

PLANS LARGER VESSELS FOR DISTANT WATERS

Owners of one-boat purse seiners presently operating off west Africa feel that larger vessels, like the U.S. seiners that fished there in summer and fall 1968, are essential for successful operations in distant waters. For example, 'Hakuryu Maru,' 500 GT, 250-ton carrying capacity, will be replaced by a 1,000-ton carrying capacity seiner to be built in 1969. The new seiner is likely to be sent first to the eastern Pacific for trials. Hakuryu Maru spent several months test fishing in the eastern Pacific before going to the Atlantic.

Year-Round Fishing Desired

Owners of 'Gempuku Maru,' another 500-GT seiner fishing off west Africa, are planning to replace her with a larger vessel. The Japanese would like to fish tuna year-round, alternating between the eastern Atlantic and eastern Pacific during the good yellowfin season.

* * *

TUNA SEINERS IN SOUTH & EAST PACIFIC

Two one-boat purse seiners, 'Nissho Maru,' 253 gross tons (GT) and 'Taikei Maru No. 21,' 210 GT, were scheduled to depart Japan in November 1968 to fish tuna in the South Pacific north of New Guinea. Nissho Maru made money in the same area in 1967. She landed yellowfin and skipjack worth US$36,111 on a 40-day trip. She had trouble with gear, transportation, and finding fish. In the 1968 trip, she was carrying a larger, improved seine, 1,143 fathoms long and 189 deep--about 100 fathoms longer and 10 deeper than the 1967 seine. The new net's sinking rate is much faster, around 18 m. (59 ft.) a minute, compared with 16.5 m. (54 ft.) for the previous one. A carrier vessel was accompanying the seiner to receive the catch. Visual methods still might have to be used to locate fish schools. Taikei Maru was alone.

4th Year of Experimental Seining

The 1968 trip was the fourth year of Japanese experimental purse seining in the South Pacific. In 1967, four seiners operated there. In 1968, two, 'Hayabusa Maru No. 3,' 280 GT, and 'Tokiwa Maru No. 53' changed plans. The former was scheduled to go to the eastern Pacific off Central and South America where Japanese long-liners were fishing. The vessel's first experimental operation in the eastern Pacific will put her in competition with U.S. tuna seiners. This region is in the yellowfin regulatory area of the Inter-American Tropical Tuna Commission. Tokiwa Maru No. 53 will operate off southern Taiwan, seeking mackerel and skipjack tuna. The owners applied for a Taiwanese fishing permit because that area was being explored by the Taiwan-chartered 'Haiho Maru No. 1,' 90 GT. ("Minato Shimbun," Oct. 31, 1968.)

* * *

Japan (Contd.):

TUNA FLEETS FISH
SOUTH PACIFIC & ATLANTIC

In October 1968, more than 120 Japanese tuna long-liners were operating off Australia in the high latitudes of the South Pacific and Indian Oceans. About 90 were fishing bluefin between 100° E.-110° E., and 35° N.-40° S., off Freemantle, on Australia's west coast, landing 1.5 to 4 tons a day. About 30 vessels on Australia's southeastern coast, off Tasmania, were landing less than a ton a day each, though a few were taking over 1.5 tons.

In Atlantic

There were more than 60 vessels in the Atlantic. After the albacore fishery off Angola tapered off, they shifted to the more northerly albacore grounds and to the central Atlantic yellowfin grounds. The combined Taiwanese, South Korean, and Japanese fleet in the Atlantic exceeded 140 vessels. This was close to previous peak Japanese operations. ("Suisan Tsushin," Oct. 1, 1968.)

* * *

U.S. PACKERS REJECT
YELLOWFIN SHIPMENTS

In October 1968, U.S. west coast packers were rejecting more than 20-30% of Japanese frozen yellowfin shipments because of improper freezing and green or dark meat.

The shipments were mostly summer catches from the Indian Ocean, where good yellowfin catches had averaged as much as 5-7 tons per operating day. Fishing vessels there could not freeze all of the catch.

Many vessels were South Korean and Taiwanese. Some of their shipments, too, were being rejected. ("Suisan Tsushin," Oct. 1968.)

* * *

EXPORTS MORE CANNED MACKEREL

Canned Pacific mackerel exports increased to about 3.6 million cases in Jan.-Aug. 1968, up 800,000 from 1967. If the trend continues, 6.5 million cases will be exported in 1968, exceeding by far the 5.07 million in 1967.

The Philippines, the leading buyer, took about two-thirds. Shipments to South Vietnam, negligible in the past, rose suddenly because the Vietnamese government removed import restrictions on food. The principal variety exported to Vietnam was the No. 1 Small (5-oz. tall 100s) in tomato sauce, priced at c.&f. US$6.60-6.70 a case. By the end of 1968, exports to Vietnam may reach 300-400,000 cases. ("Suisan Tsushin," Oct. 3, 1968.)

* * *

SAURY FISHING STEADY, PRICES UP

The saury catch, by Sept. 30, 1968, was 79,320 metric tons worth about US$9.69 million. Compared with 1967, the catch was down about 10% in quantity but was up 28% in value. Average exvessel price was $111 a short ton; it was $77 in 1967. The increase was due to brisk demand for medium and large saury in the fresh-fish market, where virtually all the larger fish are sent. In the fishing ports of Sanriku, northeastern Honshu (the island on which Tokyo is located), large saury were bringing $375 to $958 a short ton, higher than the high-priced tuna. Normally, saury prices are high early in the season and drop sharply around September. Newspaper and television advertising and promotion held prices up in 1968.

Scarcity of Tuna Bait

Vigorous demand for saury in the fresh-fish market created a scarcity for tuna-bait dealers, volume buyers of medium-sized fish (11-13 fish per kg. or 2.2 lbs.). The tuna fishery's annual bait saury requirements are around 60,000 tons for domestic fishermen, and 20,000 for the South Koreans and Taiwanese. By mid-September 1967, bait dealers already had bought about half their supply; in 1968 they had purchased practically none. The tuna fishing industry was worried about a bait saury shortage and the resulting price increase. Bait saury were quoted at $252-353 a short ton, exvessel, more than double the $126 a ton in 1967. ("Suisan Tsushin," Sept. 28; Oct. 7, 1968.)

* * *

RAISE PRICES OF CANNED KING CRAB

After Nichiro Gyogyo's price increase for canned king crab meat in early July 1968,

Japan (Contd.):

Taiyo Gyogyo also raised its price, and Nihon Suisan was expected to follow. Increased demand, decreased production, limited quantity, and increased costs have raised export and domestic prices. The major export type of canned king crab (48 No. 2 cans, fancy/case) became US$40.00 f.o.b.--up $4 a case. Nichiro Gyogyo's domestic wholesale price for No. 2 cans has been raised 50 yen (14 U.S. cents) at retail. Nihon Suisan's new retail prices also increased 50 yen for No. 2 cans. As in the past, the margin is higher for domestic sales than for exports.

Lower Prices for Tanner Crab

Because of declining canned king crab production, leading fishing companies were expected to promote consumption of canned (zuwai-gani) tanner crabs by lowering wholesale and retail prices for tanner by 20 yen (6 cents) a can. Almost all canned hairy crab will be exported. ("Suisan Tsushin.")

* * *

SHRIMP IMPORTS & PRICES, AUG.-SEPT. 1968

Frozen shrimp imports during August 1968 were 2,233 metric tons worth about US$4,677,028, down 416 tons from July. Leading suppliers in August were Hong Kong, India, Mexico, Thailand, and Australia. ("Suisancho Nippo," Sept. 21, 1968.)

Sept. 1968 imports were 2,022 metric tons valued at approximately US$4,113,900, lowest quantity in the past 23 months. The decline was attributed to the closure of the shrimp season in Mexico and other Central American countries, and the slowdown in mid-East shrimping. Japanese supplies were low in view of the approaching year-end and New Year holiday season when shrimp demand peaks. Mexico was the leading supplier with 329 tons, followed by Hong Kong with 261, Thailand with 236, and India with 222. ("Suisan Keizai Shimbun," Oct. 23, 1968.)

* * *

TUNA-IN-BRINE EXPORTS TO U.S. STEADY

In mid-Sept., canned tuna-in-brine exports to the U.S. were continuing steady at about the same pace as in normal years. By Sept. 14, 1,121,010 cases had been validated for export; 620,819 cases of large cans (55½-oz. 6's and 13-oz. 24's), and 500,191 cases of small cans (6½, 3½, and 7-oz. 48's). The large can pack is close to 35% of the 1.8-million-case annual export quota for that size. The total for the smaller sizes is nearly 42% of the 1.2-million-case annual quota. ("Suisan Tsushin," Sept. 20, 1968.)

* * *

CANNED TUNA-IN-BRINE EXPORT PRICE INCREASED

On Sept. 24, 1968, the Tokyo Canned Tuna Sales Co. increased by 20-50 cents a case its price for canned tuna-in-brine exports to the U.S. The new prices affected all can sizes except the 66½-oz. 6's.

Trading firms anticipated the price hike and bought about 300,000 cases from the company the week before. The rash of speculative buying raised sales to a record 500,000 cases; it exhausted holdings of 7-oz. 48's and reduced sharply the stock of 13-oz. 24's. Movement of the 66½-oz. 6's was slow, and unsold stocks on Sept. 24 were about 380,000 cases of white meat and 160,000 cases of light meat. ("Nihon Suisan Shimbun," Sept. 30, 1968.)

May Buy Canned Tuna From U.S.

The price increase may force trading firms to buy U.S.-packed tuna. They claim that the 50-cent-per-case price hike on the 7-oz. 48's makes it more advantageous to buy the U.S. pack. If U.S. tuna packers do not raise their prices, more Japanese firms will start selling the U.S. product packed under their own brand labels. They did this once before when the Sales Company increased export prices. ("Suisan Tsushin," Oct. 3, 1968.)

日本

Mauritius

TUNA PRICES STEADY

The October 1968 prices for tuna delivered to Port Louis, set by the Japanese Overseas Fisheries Co., at Penang, Malaysia, were: small yellowfin, US$156 a short ton, an $18

Mauritius (Contd.):

reduction; all other prices remained at July levels. Large and medium yellowfin were $315; big-eyed and bluefin, $202.

Since September 1968, albacore have been grouped into 3 size categories: large--over 33 lbs.; small--22-33 lbs.; extra small--under 22 lbs. Prices ranged from $252 for extra small to $371 for large.

Taiwan

AIDS INDONESIA

In September 1968, a 7-member Indonesian delegation went to Keelung, Taiwan's largest fishing port, to discuss plans for a Chinese firm to supply and crew 120 fishing vessels. The vessels, to operate in "3 areas inside Indonesia's territorial waters," will sell their catches in nearby Indonesian markets.

Indonesia claims an inland sea of 100 miles under archipelago doctrine, in addition to 12-mile territorial limits.

North Korea

BUYS FACTORYSHIPS
IN THE NETHERLANDS

'Keumgang San,' a factoryship built for North Korea at Verolme's shipyard in the Netherlands, launched on Oct. 12, 1968, will be completed by the end of Dec. 1968.

Keumgang San is equipped with a complete fish-meal plant, two holds for frozen fish blocks, and fish oil tanks. She has a total hold capacity of about 9,400 cubic meters, a carrying capacity of 7,050 dead-weight tons, accommodations for a crew of 256, and a 5,500-hp diesel engine.

Immediately after the launching, a keel was laid for a sistership, also destined for North Korea.

Singapore

SUPPLIES SOVIETS

Singapore is an important supply port for Soviet fleets fishing in the Indian Ocean and whaling in the Antarctic. About 70 vessels were expected to obtain water, fuel, and other supplies in late 1968.

Along Taiwan's east coast, from October through March, small boats seek spearfish, sharks, and other large fish. The fish are harpooned from spearing platform. (Commission on Rural Reconstruction)

SOUTH PACIFIC

American Samoa

SET TUNA PRICES

Japanese suppliers and U.S. packers in American Samoa agreed to a US$5-per-ton price increase for albacore and yellowfin tuna deliveries in November 1968. The new prices were, per short ton: round albacore--frozen $390, iced $375; gilled-and-gutted yellowfin--frozen $375.50, iced $370.50. ("Suisan Keizai Shimbun," Nov. 1.)

Tuna Delivery Prices at American Samoa
July-October 1968

Species	Oct.	Sept.	Aug.	July
	($/Short Ton)			
Albacore (round):				
Frozen	385	382.50	380	377.50
Iced	370	367.50	365	362.50
Yellowfin (gilled & gutted):				
Frozen	322.50	320	317.50	317.50
Iced	302.50	300	297.50	297.50

Packers and suppliers had previously agreed to a US$2.50-per-ton increase in September and a similar increase in October. The Japanese had pressed for a $10 increase, while the U.S. packers wanted to maintain August prices. ("Suisan Tsushin," Sept. 11.)

Australia

PLASTIC FISH CRATES REPLACE WOOD

The New South Wales Fish Authority has banned the use of wooden fish crates in favor of plastic. The new crates are economical, hygienic, durable, and easy to handle and store.

Made of a special "crate grade" high-density polyethylene, the new crate ensures that fish arrives at market in first-class condition. It was designed to handle about 65 lbs. of fish, 25 to 30 lbs. of ice, and to be stacked at least 5 high when full. Empty crates nest neatly and gain valuable backloading space on the trucks returning them to the cooperatives. A method of outside draining was devised that diverts water down the outside of the crate. This eliminates possible ammoniation damage to the fish stacked below.

In New South Wales, the distance from point of catch to market ranges from 50 to 550 miles. Since the plastic rate was introduced, fish quality has improved appreciably. The fish are bringing a higher price per pound.

* * *

AIRLIFTING LIVE ABALONE TO JAPAN

Australia has been experimenting with airlifting live abalone from Tasmania to Japan for gourmets who like their shellfish fresh. The trial shipments, which began in July, were so successful that Australia may start commercial shipments within the next few months. ("Shin Suisan Shimbun," Sept. 16.)

POWER FROM WAVES

Harbor buoys have been developed and tested in Japan which utilize motion of waves to generate electricity for their lights and fog horns instead of standard or solar batteries. The buoys work on two principles: a turbine-type buoy generates electricity through the vertical movement caused by waves acting on a long stem attached to its bottom; and a pendulum type converts the rocking motion of the buoy into a horizontal force that generates electricity. They are reportedly less expensive to operate and less troublesome to service--requiring a battery check only once or twice a year and general repair every two years. (Reprinted, with permission from "Science News", weekly summary of current science, copyrighted 1966 by Science Service, Inc.)

Dahomean fishermen point their pirogue seaward. In Dahomey, fish is an important source of protein. In recent years, FAO has worked to put the fisheries on a modern course: to introduce up-to-date gear and equipment (outboard motors, nylon nets) and to improve structure and management of fishermen's coops. (UN Photo)

AFRICA

Senegal

THE FISHING INDUSTRY

Senegal claims territorial waters up to 12 nautical miles from shore and exercises fishing rights over 6 more. In 1967, her marine fishery yielded 132,985 metric tons of fish and shellfish worth $18,300,000.

About 105,423 tons were landed by pirogues (canoes); 22,182 by sardine and tuna vessels; 4,236 by trawlers and cordiers (line vessels); and 1,174 by beach seines and cast nets. Sardine and sardinelike fish landings were around 45,000 tons; groupers, bluefish, sea bass, croaker, and horse mackerel exceeded 4,000 tons. Shrimp catch was 1,675 tons; oyster, shell on, slightly over 400. About 50% of the catch was sold fresh, 32% dried, 7% canned, and 10% was exported.

Shrimp Fishery

The most exciting developments are in the shrimp fishery. In 1967, half the catch came from trawlers and half from small-boat fishermen; 1968 sea production was expected to double, while river production should stay at the 1967 level.

River shrimp, primarily small and medium-size Penaeus duroarum, are caught during their seasonal migration to the sea. About three-fourths come from the Casamance River in southern Senegal, the rest from around Kaolack in the Sine-Saloum region. On the Casamance, pirogues anchored in the river fish with 2 small nets at right angles to the flow of water. The tops are kept slightly above or below the surface, depending on the amount of debris floating down river. After landing, the shrimp are trucked to Ziguinchor for processing. Peak season on the Casamance is May to August. In the Sine-Saloum fishery, shrimp are taken by drag seines in shallow estuarine areas.

The largest shrimp enterprise in Ziguinchor is Amerger-Casamance. One process used at the plant is brine-freezing of cooked whole shrimp; the management claims this adds 3% to the weight, compared to weight loss with other freezing methods. Shrimp are sent to Dakar and Europe by air or sea. SOSECHAL also operates a shrimp-processing plant in Ziguinchor.

The most spectacular development is in offshore shrimp, Penaeus duorarum. In July 1968, predictions were that the 1968 catch would be 100% greater than in 1967. Around 25 Dakar-based old side trawlers fish shrimp. Early in 1968, about 20 of them were rigged for U.S.-style twin-trawling. Results have been outstanding.

There are 2 main fishing grounds--one on the continental shelf in the north, towards the Mauritanian border, and one in the south. Production is heaviest during November to August. SOSECHAL, SURGEL, SPAC-AMERGER, and CRUSTAVIF are among the more important companies involved.

Spanish and other foreign trawlers take deepwater shrimp, P. longirontris, on the continental slope.

In 1967, 849 metric tons were exported; preliminary data put the Jan.-June 1968 figure at 1,380. France is the most important market, Belgium is next, and Spain takes much of the large size. Whole cooked shrimp are the largest exports, but sizable quantities of fresh whole, tails, and peeled are sold. Both air and sea transport are used. Shrimp exports are taxed.

Tuna Fishery

The 1967 season catch was 9,392 metric tons--yellowfin, 7,522 tons, and skipjack, 1,870--landed by 43 French and 5 Senegalese vessels. The French fish out of Dakar from November to June; the Senegalese fish all year. During July-Oct., they fish as far south as the coasts of the Congo and Angola. The vessels are owned by the Societe Senegalaise d'Armement de Peche (SOSAP), a government unit. The first of 14 new tuna vessels ordered by SOSAP from French and Soviet yards was expected to arrive around the end of 1968.

Tuna landings were divided among local canners: SAPAL, 4,995 tons; Conserverie du Senegal, 2,672; and SCAF, 1,735. Some tuna, canned in oil or natural, is consumed locally, but most is exported to France under a special duty-free quota.

Senegal (Contd.):

SOSAP is building a large cannery in the port area. It will be operated by Pecheurs de France, owners of Conserverie du Senegal, and financed by Senegal. The plant has 15,000 square meters of floor space and 2,403 cubic meters of cold storage at -20° C. Initially, there will be 2 production lines with an annual capacity of 12 to 14,000 tons. Space is available for 2 more lines, which would bring capacity up to 30,000 tons. The plant will process tuna and sardines; other species will be added.

The main problems will be to secure an adequate supply of raw tuna and to find new markets. When the SOSAP plant is completed, processing capacity will exceed 35,000 metric tons of raw tuna annually; only 9,372 tons were landed in 1967. Officials are counting on the 14 new vessels to provide supplies. The French import quota is only 10,000 tons so markets will have to be found for the anticipated increase of 200%. Senegalese producers may be forced to enter the highly competitive U.S., Italian, and West German markets.

Sardine Fishery

The 4-vessel sardine fleet--3 Senegalese and 1 French--has increased production much more rapidly than planned. In 1967, 12,364 tons were landed; half was marketed fresh, 485 tons were canned, 2,821 frozen, and the rest used for fish meal. Oversupply might disturb the small-boat fishery because the Senegalese do not like to use fish suitable for human food as raw material for fish meal--the only outlet for any sudden large increase in landings.

Fish Meal

Afric-Azote, the only fish-meal producer in Senegal, is building a larger plant. It will be able to handle 120 tons of raw fish and waste per day. As the building permit emphasizes odor control, and the plant will use cannery waste and spoiled fish, the owner has devised a refrigerated holding tank to store them. Nearly all meat is exported to France and the Ivory Coast.

Trawler Fleet

In 1967, the trawler fleet produced 3,121 metric tons worth $1,623,000. Most landings were shrimp, sea breams, sole, spiny lobster, and mullet. The catches brought good prices on the fresh-fish market in Dakar, but a large amount was processed for export.

Cordier Cooperatives

Cordiers are small line vessels built locally from FAO designs. They are 13 meters long, 6 to 8 tons, and powered by a 65-70 horsepower diesel engine. Vessel ownership is shared by the 10 fishermen who man the vessel. Twenty-five percent of each catch is sold to pay off the Senegalese Development Bank loan on the vessel. The cordiers are squeezed between high operating costs and low prices. Government officials are considering a large cooperative to overcome these problems. The success of any cooperative will hinge, in great part, on securing strong management, keeping overhead low, and educating the fishermen on their responsibilities--a formidable challenge under the best of circumstances.

INDEX

Index continued page 96.

INDEX (CONTINUED)

* U. S. GOVERNMENT PRINTING OFFICE : 1968 341-142/5

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

UNITED STATES DEPARTMENT OF THE INTERIOR

U.S. FISH AND WILDLIFE SERVICE

BUREAU OF COMMERCIAL FISHERIES

Holiday Greetings

From The

Bureau of Commercial Fisheries